SCIENTIFIC AMERICAN

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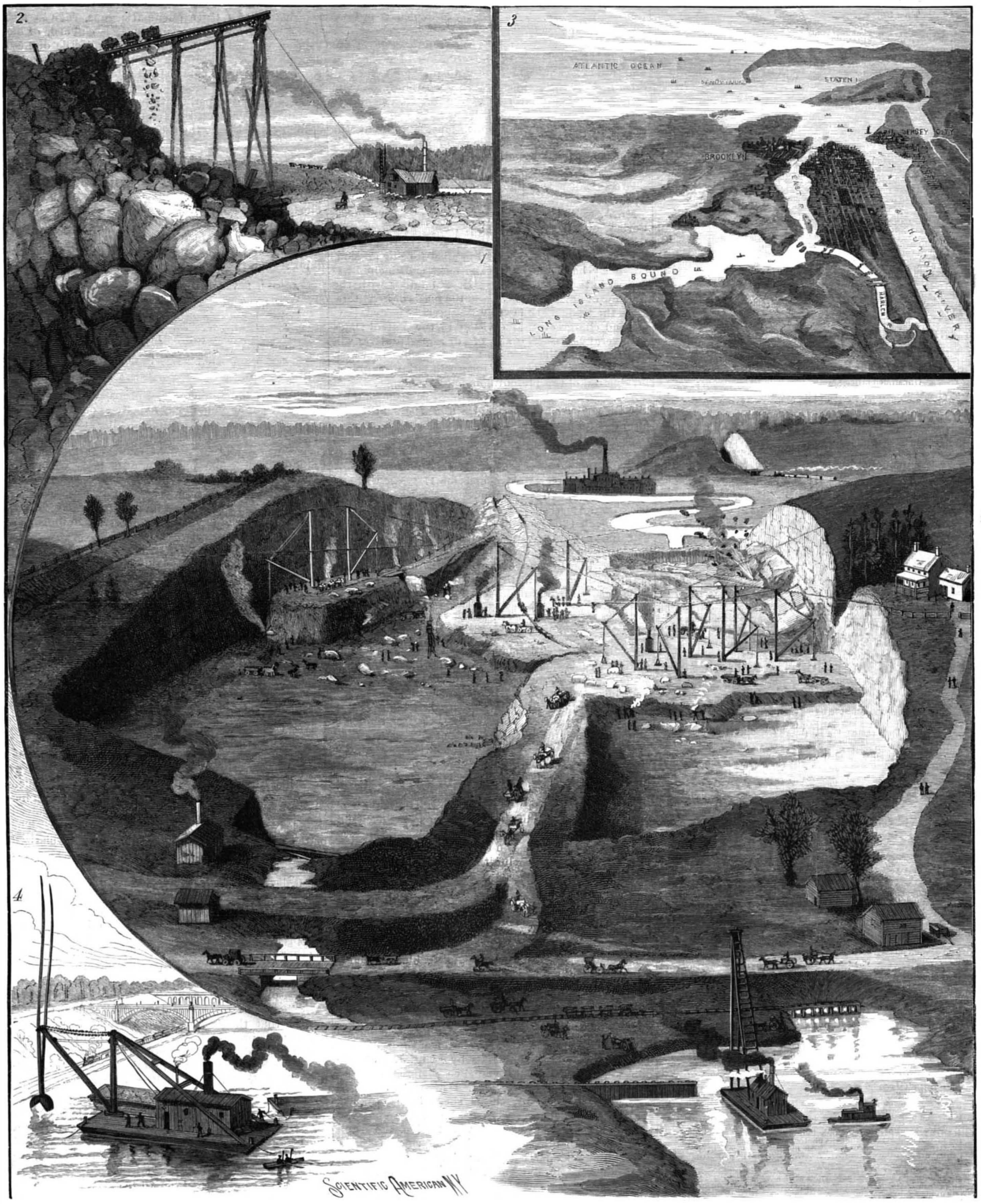

1. General view of the rock excavation and future course of the canal. 2. Dumping rock and debris from trestle. 3. Bird's eye view of the connection between the Hudson River and Long Island Sound by the ship canal and Harlem River. 4. Dredging channel in the Harlem River.

THE HARLEM RIVER SHIP CANAL.—[See page 183.]

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NEW YORK, SATURDAY, MARCH 22, 1890.

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(Illustrated articles are marked with an asterisk.)

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SCIENTIFIC AMERICAN SUPPLEMENT

No. 742.

For the Week Ending March 22, 1890.

Price 10 cents. For sale by all newsdealers.

NEW CONFERENCE OF THE INTERNATIONAL INDUSTRIAL UNION.

The object of this union, which was inaugurated in 1883, is to promote reciprocity among the various nations, in respect to industrial properties such as patents and trade marks, and, like the Postal Union, to secure to the citizens of the respective members certain advantages and facilities not otherwise to be enjoyed.

The rules of the Union provide, among other things, that trade marks and patents that have been lawfully secured in one country may be secured in all the other countries belonging to the Union, subject to the respective laws of the several countries. A priority of right to secure patents in the Union is given to the original patentee. This priority is denied to citizens of countries not members.

The United States joined the Union in 1887; but owing to the extremely liberal nature of our patent and trade mark laws in respect to foreigners, they receive little additional benefits through the Union; and owing to the peculiar rule of the Union, which only allows a term of seven months' priority from the date of the original filing of an application for a patent, the Americans have received little or no benefits.

The rules of the Union provide for conferences of the members, at which changes and reports may be considered. The next conference takes place at Madrid on April 1.

Mr. A. F. Seely, of the Patent Office, and Mr. Francis Forbes, of New York, have been appointed to attend the conference as representatives of the United States. Both gentlemen are highly qualified for the mission. Mr. Seely has had a long experience as Principal Examiner in the Patent Office. He is familiar with the working of our patent laws and the needs of inventors. With the trade mark laws he is especially posted, having had charge of that division in the Patent Office for several years. The aim of our representatives will be to secure modifications of the Union rules, by which Americans and all the members will enjoy real benefits, instead of the present nominal advantages.

Among the subjects which perhaps will come up before the conference is that of the establishment of uniform fees for patents. In this respect there is at present a great divergence. England charges $770 as fees for a 14 year patent, France $300 for a 15 year patent, and the United States $35 for a 17 year patent. In this country the patent holds good for 17 years without being worked. In France and other European countries, if an American takes patents there he is continually subjected to loss of his patent by failure to work it within a year or two years. Reforms in these directions would be very desirable. As to trade marks and goods, it is well known that imitations of American trade marks and goods constitutes the principal basis on which many European makers flourish and grow rich.

PROGRESS OF DYNAMITE GUNS.

Trials were recently made near Utica, N. Y., of shells loaded with dynamite and discharged from an ordinary cannon. The location was a ravine at Perryville Falls, and the gun used was a 9 inch English Blakesley rifled gun. Four successful shots were fired, as follows:

The first consisted in firing a shell weighing 280 pounds and containing 5¼ pounds of dynamite. The charge of powder was 12 pounds. The shell struck the cliff and one-half of the dynamite exploded. The second shell was the same, using 20 pounds of powder. The third shell weighed 300 pounds and contained 8¾ pounds of dynamite. The charge was 25 pounds of powder, the service charge for this gun. The shell did great execution on striking the rock. The shell passed through an 8 inch tree on the way without exploding the dynamite. At the cliff it burst, tore up the rocks generally, and split the steel bullet in half, one piece landing nearly a mile off. The fourth and final shot was the largest ever fired in the gun since testing; 35 pounds of powder were used. The shell, weighing 350 pounds, or a hundred pounds more than the regulation, contained nearly 19 pounds of the best dynamite. This shell blew to powder the quartz block which it hit, and the bullet ricocheted up the cliff out of sight. The dynamite all exploded at the moment of contact, and would have blown a ship out of water.

In the Justin system the projectile is cushioned and protected from the action of the firing charge in such a way as to avoid shock and explosion of the dynamite.

In 1886, 1887, successful trials by Lieut. J. W. Graydon were made at San Francisco, before boards of officers appointed by the War Department. These consisted in firing dynamite shells from ordinary cannon. Many charges were fired, and the effects of the dynamite upon the targets were terrific. The gun used was a 7 inch Ames wrought iron rifle, 23,000 lb. weight, powder charge 23 lb., weight of shell 122 lb., containing 2⅔ lb. dynamite. The new plan of pneumatic guns by the same inventor are calculated to be able to throw projectiles carrying from 6 up to 1,200 lb. of high explosives.

In 1888 we chronicled the trials with great success at Constantinople of the invention of Mr. F. H. A. Snyder, of New York, for throwing dynamite shells from ordinary guns. An ordinary field piece was used. Ten shells were fired, each carrying ten pounds of a secret explosive, containing 94 per cent of nitro-glycerine. Mr. Snyder's invention had been previously tried at Washington with success.

The Hotchkiss Ordnance Company are preparing a new style of pneumatic gun for firing dynamite shells, from which brilliant results are expected. It will constitute a new style of armament. Is adapted for field artillery as well as for ships and forts.

Our new torpedo boat Vesuvius, launched in 1888, has been so far completed that her guns were recently tested with a degree of success, as will be seen from the particulars given in another column. This fast boat is provided with three pneumatic guns, each 56 feet long and 15 inches bore, capable, it is claimed, of delivering at a distance of two miles a projectile of 1,500 pounds weight, containing 600 pounds of dynamite. No ship now afloat could stand the effect of such a projectile.

These various experiments are promising, and show that decisive progress is being made in the adaptation of high explosives to the uses of modern warfare.

The Glory of the Great Republic.

There are some eloquent figures which cannot be repeated too often and which men are too apt to forget. The fashion in which this great land has paid its debts, while others have increased theirs, is one of them. Here are the figures for just a quarter of a century, a mere span in the life of nations and the life of national debts:

	Principal.	Interest.
August 31, 1865	$2,755,995,275	$151,832,051
March 4, 1869	$2,525,463,250	$126,389,550
" 1877	2,088,781,142	94,408,645
" 1881	1,879,950,497	76.745,037
" 1885	1,405,934,350	47,013,959
" 1889	865,106,020	41,000,000
" 1890	765,273,750	36,000,000
Reduction	$1,990,721,525	$125,832,051

While we have done this, Europe, with about five times our population, about four times our wealth and not twice our natural resources, has added to its national debts in the last 20 years $8,209,000,000, or over thrice our total original debt, and the interest charge to-day is thirty-fold our own. In 1865, when our figures begun, Europe owed $15,000,000,000. It owes to-day over $23,000,000,000, it pays $1,068,000,000 a year interest, and is loaded besides with $887,000,000 for military, war, and naval expenditures, including pensions, where our own are $130,000,000.

This is the lesson of liberty; these are the fruits of freedom, and the Great Republic, without debt, without an army, without a navy, goes on in the great race of prosperity and industrial supremacy, distancing these heavily loaded competitors.—*Philadelphia Press.*

Improved Photo-Printing Plate Process.

M. Chas. Guillaume Petit has perfected a process of typographic engraving which insures, with skill, the absolute purity of the whites. This is the process: The photograph is printed on a copper plate, covered with bitumen, and developed with essential oil, which leaves the copper bare in the absolute lights. It is washed, dried, and finally covered with powdered resin. It is then heated until a grain is perfectly formed. This dressing of resin on the insoluble bitumen has the property of rendering the bitumen soluble wherever the grain is formed. By plunging the plate again into the turpentine bath, the dissolved resin leaves a deep perforation in the bitumen. The plate is then recoated with a solution of bichromatized gelatine; it is then exposed under the same negative by the aid of registration stops previously arranged, and is developed with perchloride of iron. In the pure whites there is no grain, and we have a plate where there is no need to have recourse to a tool in order to obtain the whites. Prints were shown in support of this process, which is very interesting, and may lead to other applications. M. Petit says that the dressing of resin has the effect of deoxidizing the bitumen rendered insoluble by light. We ought to know, in the first place, whether this insolubility proceeds from oxidation. Messrs. Chevreul and Kaiser have demonstrated that the effect caused by light is produced without the presence of oxygen, but with this reserve concerning a detail only affecting the theoretical question, we recognize the truly practical and very interesting communication of M. Petit.—*Photo. News.*

Cocaine Pencils for Use on the Skin.

A writer in the *British Medical Journal* makes a suggestion which is easily convertible into a capital article for a cosmetic "special." It is, in short, a pencil or "stick" for use on the chafed and irritated skin, or on skins very susceptible to insect bites, etc. He says that an addition of two per cent of cocaine to the ordinary cacoa butter pencils converts the latter into a cosmetic remedy, which gives almost instant relief when rubbed over the irritated spot.

Electricity on Board Warships.

A paper by S. Dana Greene, late ensign of the U. S. navy, on the use of electricity on board ships of war, is published in the last quarterly report of the proceedings of the United States Naval Institute. Mr. Greene suggests, among other things, that the electric motor could replace auxiliary engines on board warships, and enumerates these auxiliaries as follows:

Steam, air, and condenser pumps located in engine room, both for main and auxiliary condensers. Steam pumps for fire purposes, for pumping out the ship, washing decks, etc.; steam reversing engines for each engine; steam engines for jacking the engines; steam steering engines; steam capstan engines; blower engines for producing forced draught in the fire room; ventilating engines for ventilating the living spaces below; hoisting engines, under which head are included steam ash hoists and hydraulic ammunition hoists; steam winches about the decks for lifting heavy weights, swinging out boats, etc.; steam or hydraulic training engines for large guns; steam engines for driving the dynamos; steam engines for working lathes, drills, etc., in workshops.

Taken together, these auxiliaries will aggregate 40 or 50 engines on a large ship, representing perhaps 200 horse power. The engines, however, are never exerting their maximum power at the same time. Hence, if the work were done by motors, not over 60 or 70 per cent of this 200 horse power, allowing liberally, would have to be provided for in the dynamo room.

Transmission of Power.

M. Marcel Deprez gives an account of the electrical transmission of power at Bourganeuf, in the *Comptes Rendus*, the following abstract of which appears in the Institution of Civil Engineers' *Transactions*. The author first calls attention to the partially successful experiments on electric transmission of power between Paris and Creil which he made in 1886, and which demonstrated that 80 h. p. could be transmitted when 165 h. p. was being absorbed by the generator. In these experiments a pressure of 9,000 to 11,000 volts was used, and the failure of completely satisfactory results was attributed to the improper construction of the connecting cable, to defects of organization, and want of experience now available. This year, however, the authorities of the town of Bourganeuf decided, if possible, to utilize the power of a waterfall on the Maulde, situated 1,100 yards from St. Martin-le-Chateau, and 8¾ miles from Bourganeuf, and the work was intrusted to the Societe pour la Transmission de l'Electricite, engineered by the author. The fall utilized is about 100 ft., and develops 130 h. p. in a horizontal turbine making 150 revolutions per minute. The generator is a high tension dynamo having two armatures on the same shaft in series with one another, of the form known as the Deprez model. The electrical details of each armature are as follows: Resistance two ohms, diameter of wire two millimeters, allowing for the armature a total current of 35 amperes.

The machine is separately excited, the magnets absorbing 90 volts 20 amperes, rather more than 2 E.H.P. The line is double (out and return wires), composed of bare silicon bronze wire five millimeters diameter (about No. 6 B. W. G.) carried on porcelain insulators, giving an insulation resistance practically infinite even after prolonged rain. The total resistance of the line is 23 ohms. The motor is identical with the generator, and is excited by part of the current from the dynamo used for the illumination of the town, while to start the motor the current from a set of accumulators is used. The actual lighting machines are Gramme dynamos. Experiments with an artificial line having a resistance of 25 ohms gave the following results: E. M. F. at generator terminal 3,550 volts, current 20 amperes, the E. M. F. of the lighting machines being 115 volts and the current 376 amperes, taking the efficiencies of the low tension dynamos at 80 per cent, and the high tension machines (as experiment showed) at 90 per cent. This experiment proved that 60 h. p. could be developed at Bourganeuf on expenditure of 100 h. p. at St. Martin. The actual working of the machines has proved admirable. The regulation is effected by a pure water liquid resistance, and by a code of signals from the motor attendant to the attendant at the generator station. In a month there was only one stoppage of the generator and three of the motor, principally due to the inexperience of the enginemen. Particular precautions have been taken to avoid damage to the machinery from lightning discharges from the line, which appear to have been successful, but the methods adopted are not described by the author.

A Telephone Signal Needed.

Those who have spent a half hour or so trying to ring up a man at the other end of a telephone line, and have found out after much effort that there was no one there, would feel better if there was on the market something which would at once, when a box was rung up, give a signal stating that there was no one to receive a message, and how convenient if some attachment could be devised for communicating the time the person would return to receive the message.

Electrical Calculations.—I.

T. O'CONOR SLOANE, PH.D.

The readers of this paper often send questions as to the battery required to do different kinds of work. It is believed that a few words on the subject will be appreciated by them.

In fixing the requirements in any case of electrical supply, three factors are concerned, the maximum difference of potential in the circuit, or the electromotive force, the resistance of the circuit, and the current required. Any two of these being given, the third is deducible by Ohm's law, which may be thus expressed: The current, C, given or required is equal to the electromotive force or difference of potential, E, divided by the resistance, R. $\left(C=\frac{E}{R}\right)$ Amperes, volts, and ohms are generally used as the units of current, of potential or electromotive force, and of resistance respectively.

In considering the battery to be used, we must have regard, *a*, to the minimum number of cells that will do the work, and to their arrangement, or, *b*, to the proper number of cells to work economically. As regards the latter, it may be said that, theoretically, the more cells we use, the more economical will be their working. We can apply practical considerations only in determining the economical number, because of the fact stated in the preceding sentence. We may first consider case *a*.

A battery cell is rated by its resistance and electromotive force. Dividing the last by the first, we get the current it can give through an external resistance equal to zero, or infinitely small. Multiplying such current by E. M. F. (electromotive force), we obtain the energy which it can develop through such a circuit, such energy being expressed in volt-amperes or watts. Suppose a battery giving 2 volts E. M. F. with a resistance of ¼ ohm. Its current through zero resistance is equal to $\frac{2}{\frac{1}{4}}$ or 8 amperes. The energy it can develop through zero external resistance is equal therefore to 8 amperes multiplied by 2 volts=16 volt-amperes or watts. To ascertain the energy absorbed by any appliance, a lamp for instance, the same calculation is gone through. A 100 volt lamp of 30 ohms resistance requires a current of $\frac{100}{30} = 3\frac{1}{3}$ amperes, absorbing 100 volts multiplied by $3\frac{1}{3}$ amperes = $333\frac{1}{3}$ watts of energy.

The general rule for determining the minimum number of cells required per lamp, etc., to be supplied may be thus stated: Divide the energy absorbed in a single lamp or other apparatus by one-quarter of the energy of a single battery cell as determined above; both energies being expressed in watts. The quotient is the smallest number of cells that will do the work. In the case cited in the preceding paragraph the lamp energy is $333\frac{1}{3}$ watts. One-quarter of the battery cell energy is $\frac{16}{4} = 4$ watts. Dividing $333\frac{1}{3}$ by 4, we obtain $83\frac{1}{3}$ cells as the number required.

This rule is derived from the following considerations. If a current is passing through a circuit, energy is expended on any portion of the circuit in proportion to its resistance. If, therefore, a battery supplies an external circuit of resistance equal to its own, one-half the energy is expended in the battery and one-half in the external circuit. But the total current or energy expended on the whole circuit is equal to one-half that which the battery could develop with an external circuit of zero resistance. Therefore, the external circuit (lamp or other appliance) receives only one-quarter of the sum of the energies of the cells when calculated as short-circuited.

A less abstract way may be taken to reach the same result. A given battery does the maximum work when its internal resistance is equal to the resistance of the external circuit. By its internal resistance it acts as a rheostat. To force a given current through a lamp or other appliance and through its own cells, double the voltage is required that would supply the lamp alone, because the resistance of the battery in addition to the external resistance has to be overcome. Hence, double the cells required to give the voltage of the lamp have to be placed in series, and as this doubles the resistance, the number of cells has again to be doubled in order to form a parallel circuit, thereby reproducing the original resistance. This quadruples the battery, and the rule embodies this multiplication of the cells.

This rule is of interest, as it is so general. But where a definite voltage and amperage are to be supplied, it does not always apply. Thus, it gives the minimum battery required per lamp where a number are to be supplied, but not necessarily the number required for a single lamp only. The following rule is simple and of general applicability:

Express the ratio of resistance to voltage in the appliance to be supplied and call it $1 : n$. Do the same for one cell of the battery. If it is $1 : 2n$ or $1 : 3n$; that is to say twice as great, or more than twice as great, as that of the outer circuit, lamps, etc., the cells of the battery must be arranged in a single series in number deduced by the following rule: The number of cells equals the amperage of the outer circuit (lamp or other appliances) multiplied by the resistance of the same outer circuit divided by the difference between the voltage of a single cell and the product of the amperage of the outer circuit by the resistance of a single cell. Using small letters for the cell constants, and large ones for the outer circuit constants, the formula is thus expressed: Number of cells $= \frac{C\,R}{e - C\,r}$ If the cell ratio is less than $1 : 2n$, then, by placing two or more cells in parallel, a group can be made which will satisfy exactly or exceed as little as possible this ratio. Then the formula given is to be applied to such group exactly as if it was a single cell.

Suppose a 100 volt $3\frac{1}{3}$ ampere lamp is to be supplied. The resistance of such a lamp is found by dividing 100 by $3\frac{1}{3}$, giving 30 ohms. Suppose it is to be supplied by a battery of cells, each of 2 volts electromotive force and ¼ ohm resistance. The lamp ratio of resistance to voltage is 30 : 100 or 1 : $3\frac{1}{3}$. The battery cell ratio is ¼ : 2 or 1 : 8. This latter being more than twice as great as the lamp ratio, the cells must be placed in series by the formula: Number of cells $= \frac{C\,R}{e - Cr}$, or $\frac{3\frac{1}{3} \times 30}{2 - (3\frac{1}{3} \times \frac{1}{4})} = \frac{100}{2 - 0{\cdot}833} = \frac{100}{1{\cdot}166}$ or $85\frac{8}{10}$ cells. To test the accuracy of the work, we may apply Ohm's law. $C = \frac{E}{R + R'}$ 86 cells give E = 172 volts $R' = 21\frac{1}{2}$ ohms. R we know is 30 ohms. Substituting these in the formula, we have $C = \frac{172}{30 + 21\frac{1}{2}} = 3{\cdot}34$ amperes. A slight excess of current is given, as we have taken $\frac{3}{10}$ of a cell too much, which is unavoidable.

Next assume the same lamp to be supplied by a battery of the following cell constants: $e = 1$ $r = 8$ $c = \frac{1}{8}$. The battery cell ratio of r to e is 8 : 1 or 1 : ⅛. Fifty-four such cells placed in parallel will reduce the resistance to $\frac{1}{54}$ this amount, or the resistance of the group will be expressed by $\frac{8}{54}$ ohm, giving the ratio $\frac{8}{54}$: 1 or 1 : 6·675. Applying the formula to this group, whose electromotive force is still 1 volt, we have: Number of groups $= \frac{3\frac{1}{3} \times 30}{1 - (3\frac{1}{3} \times \frac{8}{54})} = \frac{100}{0{\cdot}506} = 200$ groups in series, nearly; or 54 cells in parallel and 200 cells in series, a total of 10,800 cells. Testing the correctness of our work by Ohm's law, we have current $= \frac{200}{28{\cdot}5 + 30}$ or 3·4 amperes, again a slight increase over that required.

Trying the Air Guns on the Vesuvius.

The Secretary of the Navy having been unwilling to receive the dynamite gunboat Vesuvius from its contractors, because the former trials of the guns with which she is supplied had been made with dummy shells, a new trial was ordered with "live" shells, which took place on the Delaware River, a few miles below Philadelphia, March 13. Gun cotton instead of dynamite was used in the shells, the kind of dynamite desired not being readily obtainable. Three 500 pound shells were fired, on a mile range, the No. 1 projectile passing 250 yards over the mile, the No. 2, 300 yards, and the No. 3, 400 yards. A large company of engineers and naval officers was present, and the trial was declared to be a great success. The three shells exploded with great accuracy at the instant they had been adjusted to go off, the first one being five seconds after striking the water, the second one second after, and the third at the instant of striking. The report of the latter explosion was heard at a great distance, and is described as having been sharper than that from any high-powered gun at present in use by our government.

The public has been led to believe this ship was built for the express purpose of firing dynamite shells, but so far not a single charge of this explosive has been fired, and there appears to be no one willing to take the responsibility of subjecting the vessel to a dynamite test. Can anybody tell us what is the real trouble?

The Head and the Brain.

Dr. Starr, of London, says that it is impossible to draw any conclusion from the size or shape of the head as to the extent or surface of the brain, and so as to the mental capacity. It is absurd to judge of the brain surface by either the size of the head or the extent of the superficial irregular surface which is covered by the skull, without taking into consideration the number of folds or the depth of creases. "For a little brain with many deep folds may really, when spread out, have a larger surface than a large brain with few shallow folds." What do phrenologists say to this?

CAMPHORIC acid is a substance that has been introduced very recently into medicine. It is a crystalline body, forming colorless, needle-like crystals, it is difficultly soluble in water, but dissolves freely in alcohol and ether. It is recommended for external application in the treatment of chronic diseases of the larynx, throat, and nose, and is administered in solutions of 1 per cent or more in weak spirit.

SMOKELESS GUNPOWDER.

Much has been written lately concerning the smokeless powder that has been adopted by the French army, and which foreign nations have vainly tried to copy. Nevertheless, comparatively few have had the opportunity of witnessing any experiments with this new product, and do not recognize certain differences that exist between the old and the new powder. Without examining into the ballistic properties of this explosive, we shall refer simply to the suppression of the smoke and the advantages to be derived therefrom.

Through the kindness of one of our colleagues, Mr. Paul Gers, the distinguished amateur photographer, we have the good fortune to be able to present to our readers two very interesting photographic reproductions of the trials. The first photograph, Fig. 1, represents a volley in which the gun used was of the model of 1874, and the other proof represents a similar trial in which the gun with the smaller caliber of the model of 1886 was used.

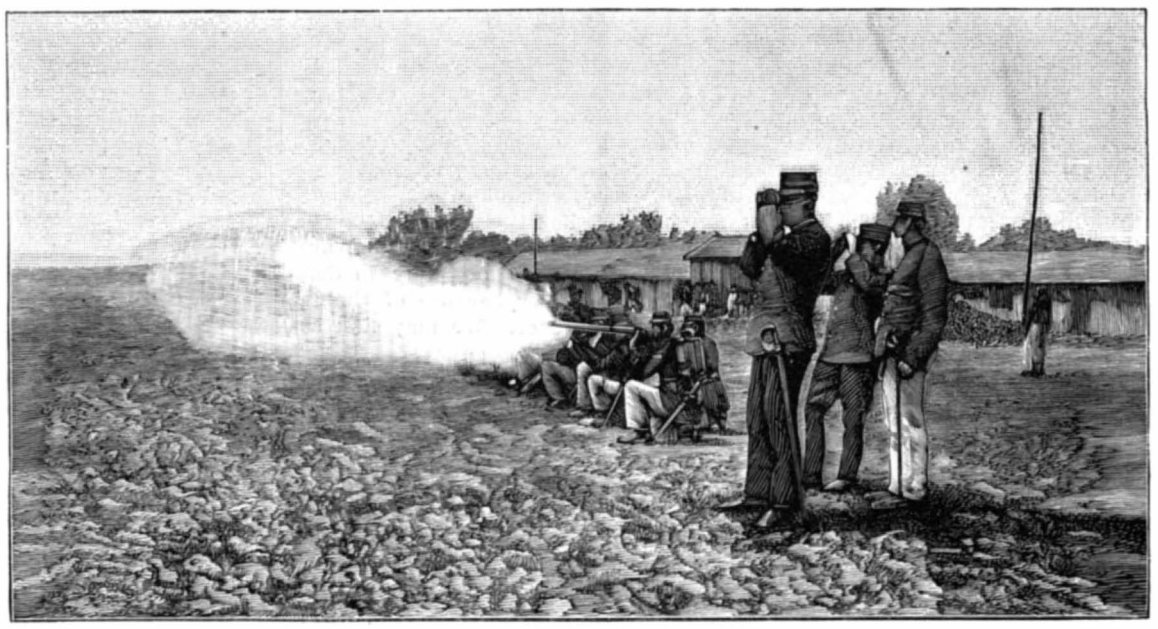


Fig. 1.—FIRING A VOLLEY WITH COMMON POWDER.

In the first trial common powder is used; in the second, the smokeless powder. The difference is very striking and scarcely needs any comment.

It must be borne in mind, however, that in the discharge of firearms the cloud of smoke is very rapidly modified in such a way that it presents a very different appearance at different instants. The proofs in question were taken immediately after the order, "Fire." Thus, with the model of 1874 and the old powder the cloud of smoke is at once projected forward and then floats back upon the troops, whom it conceals completely. The photograph shows the first period after discharge. With the new powder, at the discharge there is a slight veil, which immediately disappears. This veil is entirely invisible at a distance of 100 paces. In the instantaneous photograph it is exaggerated, and the photographic plate in this, as in other cases, has brought out more than the eye is able to perceive. This absence of smoke will have an unforeseen influence upon future wars.

The troops will be able to shoot with much greater accuracy, as they will not be blinded by the smoke of the powder. Furthermore, their position will not be as readily indicated to the enemy as with the old powder.

It is well known that the location of the person shooting is not able to be determined with any accuracy without the help of the smoke. On the other hand, the troops of the second line, who serve as a support and re-enforcement and who could conceal their movements under the curtain of smoke produced by the first fire, lose the benefit of this shield, the advantage of which, however, is much questioned by competent authorities. The adoption of the smokeless powder will certainly introduce some changes in military tactics, and it will be interesting to observe what modifications will be introduced into the tactics on the field of battle.—*Albert Londe, in La Nature.*

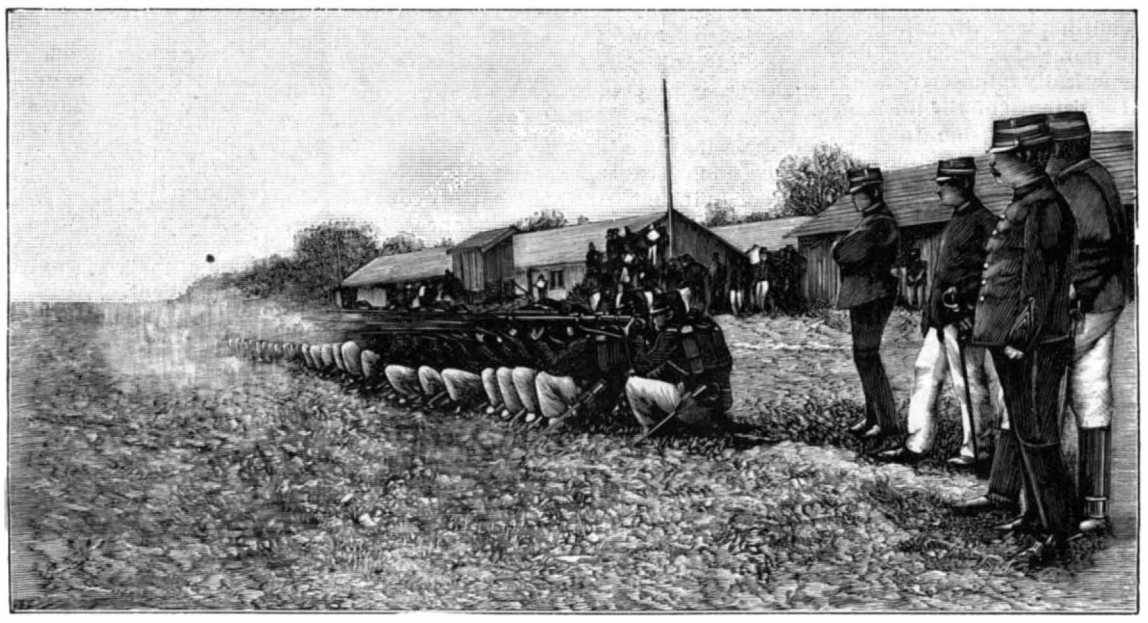


Fig. 2.—FIRING A VOLLEY WITH SMOKELESS POWDER.

Height of Wave Dashes.

At the office of Major Handbury, United States Engineer, is to be seen a "dornick" of basalt weighing 62 pounds, which was brought from Tallamock Light by Mr. McClure, lampist of this district.

He reports that a most fearful storm was lately experienced at the rock, and that the dornick was thrown up by the force of the waves and fell on the roof of the lightkeeper's house, 110 feet above the sea level, breaking a hole in the roof. The waves were so high that the water came down the chimney of the boiler house of the fog siren in torrents, and poured out through the tubes of the boiler. The chimney is about 130 feet above sea level. The spray entered the cowl of the chimney over the lamp, which is 150 feet above sea level, and ran in streams to the bottom.—*Portland Oregonian.*

The Florida Phosphates.

In the maze of accounts from all quarters of South Florida, the following may be accepted as an approximate location of the Florida fertilizer belt. From about Archer, a point on the south border of Alachua County, a line slightly east of south may be drawn to the mouth of Peace River, which empties into Charlotte Harbor. This line, according to present knowledge, fairly bisects the available fertilizer field, which averages about a dozen miles in width, and, it will be seen, constitutes at least a third of the west part of the peninsula. The limits north, south, and west are, of course, subject to revision with the investigating spirit encouraged, and it is already claimed that phosphates in similar abundance may be found in the northwestern counties. The line mentioned extends through parts of Alachua, Levy, Marion, Citrus, Hernando, Pasco, Hillsboro, Polk, and De Soto counties, and is about 160 miles in length.

Although everywhere throughout the territory traversed by this line every one is on the alert in regard to phosphates, and the far southern counties are already the scene of surprising development, perhaps the main center of interest is the little town of Dunnellon, on the Withlacoochee River, which forms the boundary between Marion and Citrus counties. It is a striking illustration of the newness of the discovery that only a few months since, in a pamphlet setting forth the beauties and advantages of the country around Dunnellon, while picturesqueness, health, orange groves, vegetable gardens, boating, fishing, etc., were freely spoken of, not a word was said as to phosphates, which are now the all-absorbing subject. The particulars of the discovery and the resulting incidents are highly interesting. Hon. John F. Dunn, who is the ruling spirit in a great enterprise which has already made Dunnellon famous, has given for publication a statement which shows graphically the origin of what has transpired. Last June Mr. Albertus Voght left with him a package of marly earth discovered in digging a well near Dunnellon. He determined to have it analyzed. The result showed that it was rich in phosphoric acid, and that in fact this "flinty-looking grayish white substance" represented a hitherto overlooked mine of wealth for Dunnellon and all Florida. Investigation proved that the substance existed in immense quantities. Professor Shepard, of Charleston, one of the original discoverers of the South Carolina phosphates, visited the spot, and his verdict confirmed the dawning supposition. The speedy result was the purchase by Mr. Dunn and a number of other capitalists of many thousands of acres of phosphate lands, and the formation of the Dunnellon Phosphate Company, with a capital stock of $1,200,000. Representatives of the Bradley Fertilizer Company, of Boston, are said to have bought 4,000 shares in the Dunnellon Phosphate Company, for which they paid nearly $400,000. The Dunnellon Company controls 35,000 or 40,000 acres of the best lands. The Baldwin Fertilizer Company, of Savannah, has bought not less than 40,000 acres of phosphate lands. Representatives of the Augusta Fertilizer Company, of Georgia, are also buying largely. Many of the heaviest investors are Florida men, but nearly every large fertilizer firm in the United States has a representative either buying up lands or getting short options on them. The excitement throughout all the adjacent country is intense. Land hitherto deemed almost valueless commands almost anything the owner likes to ask, and many formerly poor men are realizing fortunes on their sales.

In the country tributary to Peace River much the same spirit prevails. In the neighborhood of Arcadia, which is a second Dunnellon, at present three companies are operating—the Moorehead, Scott, and Peace River Phosphate Company. The Moorehead Company is building a railroad from the Arcadia depot to the works at the river. The Peace River Phosphate Company is a heavy corporation, with headquarters in New York City, Gen. Nutters as president, and Maj. Singleton local manager. The Scott Company have put up works at Zolfo Springs, a railway station eighteen miles above Arcadia, and will soon be shipping heavily. It is expected that soon the three companies will run a regular phosphate train daily to the North. In the neighborhood of Bartow, in Polk County, large finds have been made, and sales of land have been effected at a great advance. The phosphate deposits around Fort Meade are reported as large and exceedingly rich.

The discovery of phosphates in Florida, in almost incredible abundance and a large portion undoubtedly of the highest value, is indeed a wonderful event in the history of a State that has experienced extraordinary vicissitudes. It comes most timely when the whole industrial community is awakening to a sense of its strength, and it will give a stimulus to every energy of the people. It will make Florida the headquarters of an interest contributing to the main industries of the country, and in more senses than we can pause to enumerate, it will bring Florida to the front rank of States in wealth and in industrial and commercial importance.—*The South.*

Cheap Production of Iron.

A correspondent to one of our daily newspapers states that the balance sheet of the Woodward Iron Company, of Birmingham, Ala., a few months ago showed the total average cost to the company, including repairs, interest on capital invested, improvements, etc., of producing pig iron, had been only $8.36 a ton for the year just then ended. During one month of the year the average total cost had run down to $7.71 a ton, which is the lowest we have ever known of pig iron being produced.

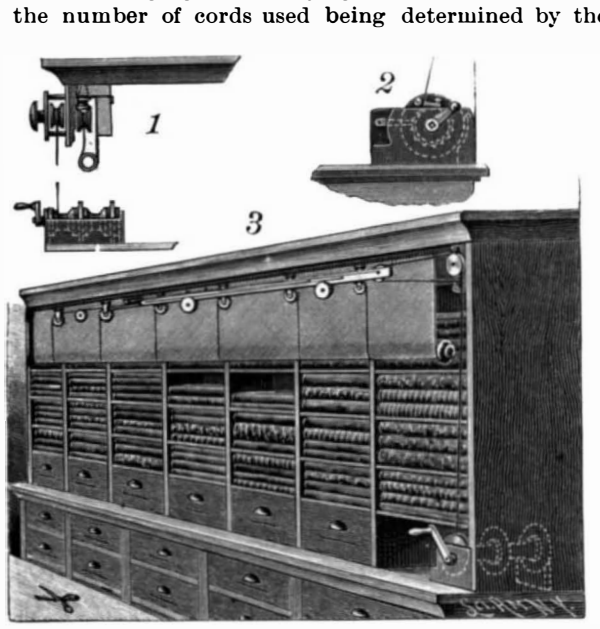
FIRE IN A CAR.—On the west bound overland train from Ogden, February 27, when 35 miles west of that point, a fire was discovered in the mail car. Finding it impossible to extinguish the flames, an effort was made to reach a water tank six miles distant, and, although the speed of a mile a minute was maintained, the water tank was reached too late to be of much use, 158 sacks of through mail being almost wholly consumed.

An Insurance Company with over $100,000,000 Assets.

The forty-fifth annual report of the New York Life Insurance Company, a summary of which appears in another portion of this paper, presents some telling figures as to the great strength and remarkable prosperity of the company. Its income for the year 1889 was over twenty-nine million dollars, and it paid to policy holders during the year over twelve million dollars. The assets of the company on January 1, 1890, were $105,053,600. It goes without saying, therefore, that those insuring in such a company may be quite as sure of the prompt payment of the amount called for by each policy as they would be if the money itself was deposited to their credit in the best bank or trust company. All the leading items in the company's business show a large increase over the corresponding items for the preceding year, and with the excellent management which has been for so many years an eminent characteristic of the company, it is difficult, if not impossible, to conceive of any calamity so serious as to materially impair its resources.

AN IMPROVED CURTAIN FIXTURE.

A fixture especially adapted for use with curtains covering shelving in stores, whereby the curtains may be readily rolled up or unrolled, is illustrated herewith, and has been patented by Mr. John L. Baker, of Greensborough, N. C. Figs. 1 and 2 are sectional views of the operating parts, Fig. 3 representing the practical application of the improvement. Beneath the cornice and secured thereto are arranged perpendicular hangers, each carrying a grooved friction pulley, and slightly to their rear are secured horizontal sheaves, each carrying a grooved pulley, a series of pins being also projected outward from the beading or cap piece beneath the cornice, each pin carrying a loosely turning collar, and these collars forming friction rolls for a strip or bar of wood about one-half the length of the cornice. The upper end of the curtain is rigidly secured to the beading or cap piece, the curtain having a pole at its lower end, and cords secured to the cap piece passing downward on the inner face of the curtain and perpendicularly upward on its outer face, the number of cords used being determined by the



BAKER'S CURTAIN FIXTURE.

length of the curtain. The bar sliding on the sleeved pins has a friction roller journaled at one end, and all the cords which pass upward in front over the hanger pulleys, and certain of the cords which pass through the sheaves, are attached to the rear of the sliding bar, there being a connection between the end of the bar carrying the friction pulley and a windlass. As shown in the illustration, two reels are provided for the manipulation of two curtains, both of which cover one set of shelving, as when an inner gauze and an outer heavy curtain are desired, the reels being adjustable to manipulate each curtain separately. Shelving on opposite sides of a partition may also have curtain fixtures operated from one shaft or windlass.

DECISIONS RELATING TO PATENTS.

Supreme Court of the United States.

EVORY V. BURT.

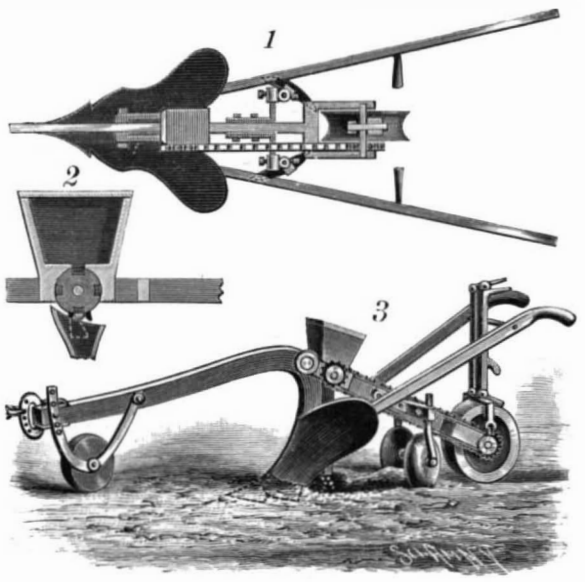
Letters Patent No. 59,375, issued to Alexander F. Evory and Alonzo Heston, November 6, 1866, for an improvement in boots and shoes, *Held* to be for the manufactured article and not for the mode of producing it, and declared to be invalid for want of patentable novelty.

A mere carrying forward or more extended application of an original idea—a mere improvement in degree—is not invention.

Where certain parts of a water-tight shoe were old, a simple change in the form and arrangement of such parts, subserving the same purpose as like parts of shoes constructed under earlier patents and without causing any new function to be performed, does not constitute invention.

AN IMPROVED LISTER AND DRILL.

The accompanying illustration represents a combined lister and drill whereby any desired amount of soil can be turned onto the seed in the center of the trench formed by the plow, Fig. 1 being a plan and Fig. 3 a perspective view, while Fig. 2 is a sectional elevation of the seed box. On the plow beam is pivoted



LOUGHRY'S LISTER AND DRILL.

a curved bar carrying a wheel traveling on the ground in front of the plow, and designed to regulate the depth of the trench to be formed, the bar being adjustable higher or lower by means of a pin passed through apertures in its forward end and the plow beam. Near the rear end of the beam is pivoted a backwardly extending frame, carrying at its rear end a shaft with a grooved wheel held in line with the plow, and on this shaft is a sprocket wheel which operates, by means of a chain, the seed-dropping wheel, the latter having recesses in its periphery adapted to register with an aperture in the bottom of the seed box. The seed are discharged into a spout extending downward between the mould boards into the center of the trench formed by the plow, the latter having a small ridger or subsoiler extending below to form a small furrow into which the seed is dropped. Angle irons are secured on each side, back of the seed box, and two rods are adjustably attached to depend from these angle irons, there being mounted to turn loosely on the lower end of each of these rods a concaved disk held in front of the rear grooved wheel, these disks being set at an angle to each other, so that the soil turned up by the plow is thrown onto the seed dropped in its rear. The grooved wheel following directly behind the disks serves to tamp and give an oval form to the ridge over the seeds in the bottom of the trench. The rear end of the frame is pivotally connected with a rod extending upward between the plow handles, and on this rod is a handle by means of which the operator can conveniently lift the grooved wheel and the disks when desired, or by which they may be retained in elevated position. Next to the handle is also pivoted a spring lever pivotally connected by a link with a scraper, for scraping off any dirt gathering on the periphery of the grooved wheel.

The Chicago Elevated Railway.

The Lake Street elevated railway, of Chicago, is now in progress of construction. The line is from the east end of Lake Street along that street to the village of Oak Park, about four and one-half miles. In order to get a franchise for the line, it was necessary to obtain the consent of fifty-one per cent. of the owners of the property fronting upon it, exclusive of public property. This has been done, says the *Railroad Gazette*, and the company has contracts with the property owners and receipts for payments for right of way, thus preventing future questions of damages.

The posts are placed on the curb line. The stations are to be built in the middle of the blocks, in buildings bought or erected by the company, leaving the sidewalks entirely free. It is proposed to build the "up" and "down" stations on alternate blocks, and to make them architectural improvements to the street. The entrances and exits will be entirely within the buildings, and many applications have already been received for renting office room in the stations, and the company expects to make them a considerable source of revenue. By the requirements of the ordinance the company is compelled to build sixteen stations for four and one-half miles of road, but it is contemplated to start with thirty-two.

The plans and specifications for the structure have been prepared under the supervision of Mr. Theodore Cooper as consulting engineer. A contract for all of the iron work and erection has been made with Messrs. Cofrode & Saylor, of Philadelphia, and erection has already been begun. Between twenty and thirty spans are now up. Messrs. Alberger & Fitzgerald are the general contractors for building and equipping the road.

The structure is of wrought iron posts and girders; the posts having a horizontal section of 14 in. by 15 in. Provision for expansion and contraction of the longitudinal girders to the amount of ¾ in. will be made in each span; one end of the girder being free to move, and the other bolted to the cross girder. The clear spans of the girders will range from 45 ft. to 60 ft. The cross girders will be of wrought iron with upper and lower chords and web members riveted up of plates and angles.

The Eyes of the Mole.

Carl Hess, the German naturalist, says *Nature*, has proved by minute microscopical investigation that the eye of the mole is perfectly capable of seeing, and that it is not short-sighted, as another naturalist (Kadyi) would have us believe. Hess maintains that, in spite of its minute dimensions—1 millimeter by 0·9 millimeter—the eye of this little creature possesses all the necessary properties for seeing that the most highly developed eye does, that it is, indeed, as well suited for seeing as the eye of any other mammal, and that in the matter of refraction it does not differ from the normal eye. In order to bear out the theory of short-sightedness, the physiological reason was adduced that in its subterranean runs the mole is accustomed to see things at close distances, and that its eye had become gradually suited to near objects. But to this Hess objects that the mole when under ground most probably makes no use of his eyes at all, as it would be impossible to see anything, owing to the absence of light, but that when he comes to the surface, and especially when he is swimming, he does use his eyes. In order to accomplish this, he only has to alter the erect position of the hairs which surround and cover his eyes, and which prevent the entry of dirt when he is under ground, and at the same time to protrude his eyes forward.

AN IMPROVED SENSITIVE DRILL.

The accompanying illustration represents a new form of drill, in which the variations of speed and power are designed to be so completely under the control of the operator, and the adjustments so perfect, that the person using the drill is always able to determine the pressure which is being applied. The speed of the drill spindle can be increased or diminished instantly, or the motion reversed, without stopping the machine or shifting belts, more or less power being applied to the spindle as the size of the drill or the nature of the work may require. The feed lever has a very sensitive ad-

BARNES' SENSITIVE DRILL.

justment, which makes it possible to use the smallest drills with the least possible danger of breakage. By a hand screw within convenient reach the platen or table can be moved rapidly on the column, and can be clamped firmly at any desired height. This drill is made by the W. F. & John Barnes Co., No. 9 Ruby Street, Rockford, Ill.

The Whistling Well.

In accordance with a request made to me by the editor of the SCIENTIFIC AMERICAN, I write what I believe to be the first description of what is known locally as the "whistling well," that has appeared in any scientific publication. The well is located on the farm of Colonel Weston Flint (for many years Patent Office Librarian), in the town of Great Valley, Cattaraugus County, N. Y., about twenty miles from where the writer now resides.

About forty-five years ago the father of Colonel Flint undertook to dig a well. At a depth of twenty feet a little water was found, but as it was thought to be insufficient, the well was continued to a depth of forty feet, and ended in coarse gravel, with no trace of water, except that already mentioned. Thinking that the cavity might form a reservoir for the dripping water from the small vein that had been cut, the well was stoned up in the usual way. No water, however, accumulated, and as a water well it was a failure. Before long it was discovered that at times a strong draught of air rushed *into* the well, and at other times rushed *out* with equal force.

A flat stone with a 1¼ in. hole through its center was fitted over the mouth of the well. Into the hole was fitted a whistle, which changed its tone, dependent upon the upward or downward current of air through it. It was soon learned that the whistle was a most reliable weather prophet or barometer.

In settled weather the whistle was silent. An approaching storm was heralded by the warning shriek of the whistle as the air rushed out of the well, but as clearing weather approached, the current of air changed and rushed into the well, and the faithful whistle told the story by its changed tone.

When I last visited the well, which was about five years ago, the whistle had been removed as worn out, but the flat stone with a hole in it was and is now in place.

While the air was rushing out one day, I tried to test the pressure by putting a chip of wood of the size and thickness of a man's hand over the hole, and it was thrown up more than twelve inches. I have often seen it during a rain storm, and as the water began to run down through the hole, the outflowing current of air threw it up in spray several feet high, giving it the appearance of a fountain.

This well attracted a good deal of local attention at first, but a generation of people has grown up about it, and I do not so often hear it spoken of as a curiosity, but it is the staple source of weather prognostications in that vicinity.

The well is located about fifteen rods from a fair-sized creek. The bottom of the well must be some fifteen feet below the bed of the stream. Between the well and the creek is a very good spring of water. On the farm adjoining, and about thirty rods distant, a well was bored 75 to 100 feet deep, and affords plenty of water. No such phenomenon was observed in boring this well.

Six years ago another neighbor undertook to dig a well on the opposite side of the creek, and about 100 rods distant from the whistling well. At about thirty feet deep the well was in coarse gravel and no water. At that time a heavy shower sent a flood of surface water into the well, and it disappeared quickly, but immediately after a roaring sound, something like the hum of a thrashing machine, came from the open well. This was heard by many people, but not by the writer.

Through some feeling of superstition on the part of the owner, the well was at once filled up and further investigations prevented.

The surface rock in that vicinity is a sort of sandstone, and the underlying rock is slate and is "in place." There is no limestone, hence no connection with caves. No scientific investigations have ever been made of the whistling well.

I should be pleased to hear some reasonable explanation of the phenomenon described. I shall be glad to visit the well with any person wishing to investigate, or to furnish further particulars if desired.

A well somewhat similar, located somewhere in the South, was described by a writer in the SCIENTIFIC AMERICAN about two years ago, and an explanation asked for, but thus far there has been no response published.

Yours truly,
F. S. OAKES.

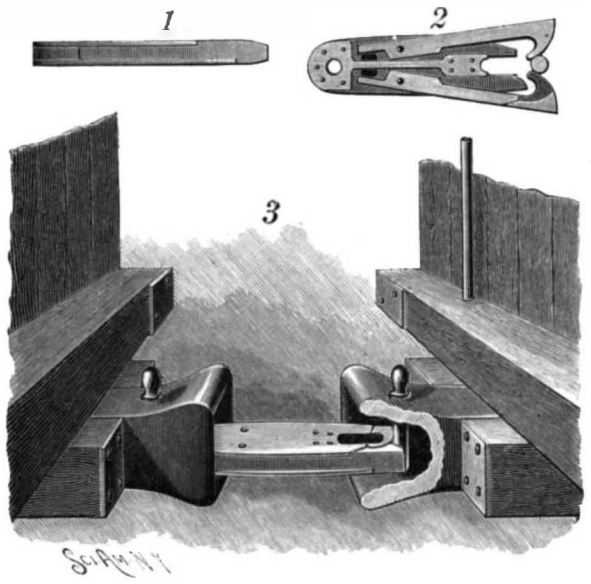
Cattaraugus, N. Y., February 20, 1890.

Comparative Rank in Population of Cities of the United States in 1880 and 1890.

Rank in 1880.		Estimated rank in 1890.	Rank in 1880.		Estimated rank in 1890.
1	New York	1	11	Cleveland	11
2	Philadelphia	2	38	Minneapolis	12
4	Chicago	3	13	Buffalo	13
3	Brooklyn	4	18	Detroit	14
6	St. Louis	5	12	Pittsburg	15
7	Baltimore	6	14	Washington	16
5	Boston	7	19	Milwaukee	17
8	Cincinnati	8	16	Louisville	18
9	San Francisco	9	30	Kansas City	19
10	New Orleans	10	45	St. Paul	20

AN IMPROVED COUPLING LINK.

The accompanying illustration represents a link capable of use with any drawhead, and adapted to automatically couple with the pin in an approaching drawhead. It has been patented by Mr. Harry Ackerman, of No. 306 Second Street, Jersey City, N. J. Fig. 1 is a side and Fig. 2 a plan view of the link, the latter showing one of the plates removed and the arms carried out to their farthest position, while Fig. 3 shows the device in use. The body of the link is held between a top and a bottom plate, secured together by rivets, and consists of a casting or forging with a rib-like central section, on each side of which is pivoted a latch arm, both having hook-like heads adapted to interlock when closed. Upon the opposite sides of the arms a recess is produced in the heads, whereby the hook portion of one head will slide beneath the hook portion of the opposite head. The two arms are held in their locked or closed position by means of springs, preferably of rubber, located between the central rib of the body and the inner extremities of the arms, these springs yielding sufficiently to allow the arms to be pressed open by the pin in an approaching drawhead, and closing the arms automatically as soon as



ACKERMAN'S COUPLING LINK.

such pin enters the slot to the rear of the hooked heads. To uncouple the arms are forced outward by hand, or in any other approved manner.

Torpedo Gunboats for Chili.

Some time ago the government of Chili decided that it was necessary to increase the national navy. It was considered of the utmost importance to be able to keep the communications along the coast open, many of the towns, from the nature of the country, being almost unapproachable by land, their supplies depending on the communication by sea. A commission was therefore appointed and sent to Europe, with a view of arranging for the construction of one very powerful armorclad, two swift cruisers, and two torpedo gunboats of the Rattlesnake type. The order for the two torpedo gunboats was placed with Messrs. Laird Brothers, Birkenhead, who have just launched one of the vessels, while the second is almost ready for launching. The boats are rather larger than the Rattlesnake, measuring 240 feet in length by 27 feet 6 inches beam, the maximum draught of water being from 9 feet to 10 feet. The vessels are divided into 38 water-tight compartments, a center line bulkhead dividing the two engine rooms and the two sets of boilers. The machinery space is protected by steel bulkheads extending from the bilge to the gunwale, and forming the coal bunkers. The vessels will be fitted with two pairs of triple expansion engines, designed to develop 4,500 horse power under forced draught, and to drive the gunboats at a speed of 21 knots. The armament will consist of seven Hotchkiss and two Gatling guns, besides five torpedo guns.

Improved Draught Appliances for Freight Cars.

The effect of air brakes and automatic couplers in making a modern freight car a more highly organized and expensive structure is extending to other portions of the car, particularly the draught rigging and the truck.

With an efficient apparatus to control speed and stop quickly, the tendency is to run freight trains at speeds twice as fast as has been regarded safe practice in previous years. The other details of freight cars, however, are retained and used now, and some of them are not suited to the new condition of things. Their rapid wear and frequent failure is pointing plainly to the necessity of further improvement in the way of more substantial, and consequently more expensive, construction.

The economy resulting from high speed freight trains is not to be all clear gain in freight receipts, for a portion of the increased earnings must be expended in more durable material and better workmanship, or that economy will not be maintained.

The sudden application of quick-acting brakes at high speed in mixed trains composed of cars fitted with link and vertical plane couplers will result in a more severe trial of drawbars and draught rigging than they have had heretofore. In switching, the use of automatic couplers will lead to quicker work and higher speeds, because the engineer will not have the fear of injuring his fellow trainmen constantly in mind, and he will not exercise the same care as when switchmen had to go between the cars. The caution which protected the man, and, incidentally, the car, will now be relinquished, and the couplers and their attachments will suffer by it.

The draught rigging of freight cars, as is well known, is the one part requiring most frequent repairs, and the number of cars delayed for such repairs is certainly on the increase, as it amounts to 60 per cent of all cars held in shops and on track for repairs.—*Master Mechanic.*

The Nicaragua Canal.

The election of ex-Senator Warner Miller to the presidency of the Nicaragua Canal Company, at a meeting of the directors in New York, on the 6th inst., is an additional indication, if any such were needed, of the intention of the promoters to push this great enterprise with energy and business sagacity to its conclusion. The former president of the company, Mr. Alfred C. Cheney, of the Garfield National Bank, is still as actively connected with the enterprise as ever, and is now vice-president; but the time has come when the canal requires a working manager who can devote all his time thereto, which President Warner Miller intends to do, pushing the work, as he says, "with all the vigor that men and money can bring to bear on it." The board of directors includes many men of high standing in the financial and business world, and, though there has not been much flourish of trumpets about what they are doing, as was so conspicuously the case at Panama, all accounts agree that the preliminary work has been most thoroughly performed and a substantial commencement made toward the building of the canal.

The Torpedo.

At a recent meeting of the Physiological Society, Berlin, Prof. Fritsch spoke on the anatomy of *Torpedo marmorata*. In opposition to the revolutionary views of many recent investigators, who deny the nervous nature of the ganglion cells, he laid great stress upon the extremely close relationship which exists between the ganglia and end organs, and is so strikingly shown in the torpedo. A thick nerve fiber runs from each ganglion cell to the electrical organ, divides into twelve to twenty-three fibrils before it reaches the organ, and each of these fibrils is connected up with some one special plate of the organ. Now, since each plate, which is of hexagonal shape, owing to the close juxtaposition of the columns, receives one nerve fiber at each of its angles, it hence follows that the number of the plates must be, on the average, three times as great as the number of the ganglia. The fibers of one ganglion supply eighteen plates, the latter (being hexagonal) require six times eighteen fibers for their supply, and since on an average eighteen fibers run out from each ganglion, it requires six ganglia to supply eighteen plates with nerves.

The speaker had counted the plates of an electrical organ in the torpedo, and obtained a number corresponding closely with an older enumeration of Valentin's made on a torpedo of the same size; the number of plates he found to be 179,625. He had further counted the ganglion cells which supply the plates with nerves and found them to number 53,739; this corresponds closely with the enumeration of Boll, who counted 53,760. The counting of ganglion cells is subject to much uncertainty, chiefly owing to the fact that in sections of the central nervous system many cells are cut through, and are thus liable to be counted twice; hence the speaker had enumerated, most readily by means of photographs, the axis cylinders of the nerves which supply the electric organ; he found them to number 58,318, corresponding to the same number of ganglion cells. The last number is nearly one-third the number of plates in the electrical organ, and corresponds closely to the number which should be found if the older view is the correct one, that the ganglion cells are the centers for the nervous end organs.

The New Postage Stamps.

The portraits and colors of the new issue are as follows:

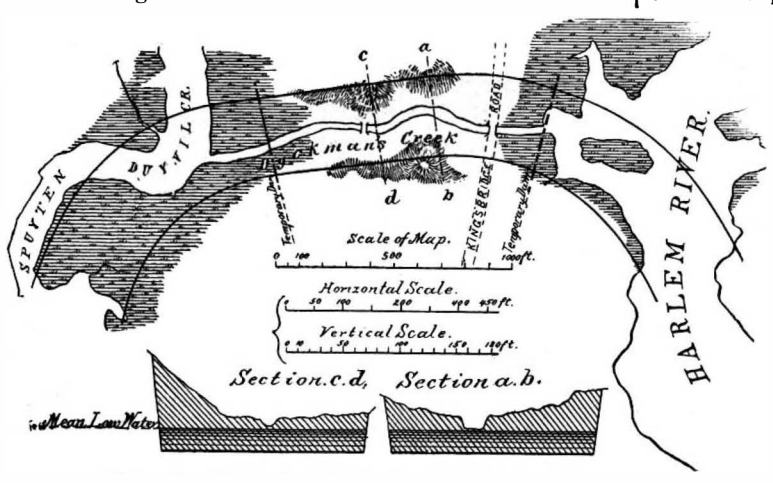
One cent—Franklin; ultramarine blue.
Two cent—Washington; carmine.
Three cent—Jackson; purple.
Four cent—Lincoln; chocolate.
Five cent—Grant; light brown.
Six cent—Garfield; not decided.
Ten cent—Webster; milori green.
Fifteen cent—Henry Clay; deep blue
Thirty cent—Jefferson; black.
Ninety cent—Commodore Perry; orange.

The number of stamps ordered before ready for issue aggregated nearly 44,000,000, representing $784,323.

THE HARLEM RIVER IMPROVEMENT AND SHIP CANAL.

We illustrate in the present issue the progress of work upon the ship canal now being excavated across the upper end of Manhattan Island, New York City. The work is in pursuance of what is known as the improvement of the Harlem River, New York, and is being executed by the Federal authorities under the direction of George L. Gillespie, Lieut.-Col., Corps of Engineers, U. S. A., who is chief engineer of the operations. The history of the improvement extends over a number of years, beginning in 1873. The river and harbor act of March 3 of that year directed an examination to be made of Harlem River near the East River for the removal of rocks therefrom. Appropriations were made in successive years, and the examination of the Harlem, with certain improvements, was continued, until eventually it was decided that navigable connection should be made between the upper part of the Harlem and the Hudson River. The natural connection is by the water of Spuyten Duyvil Creek. This stream, which is very narrow and shallow in places, follows a crooked course and is available only for rowboats, except for a limited distance. Various ways were proposed of connecting the two rivers, but eventually, after due estimates of cost, the cut through what is known as Dyckman's Meadows, near Kings Bridge, a little above 200th Street, was determined on. Many legal difficulties were experienced and considerable trouble was had in obtaining the consent of the owners of adjacent properties. In some cases compromises were made, and eventually, in 1888, borings were made across the route to determine the character of the soil, and work shortly afterward began and is now in active progress.

Our large cut shows the eastern end of the new canal.



MAP OF ROCK CUTTING ON HARLEM SHIP CANAL.

At this place the waters of Dyckman's Creek formerly ran across the island, connecting Spuyten Duyvil Creek with the Harlem. The last named creek can be seen in the cut a little to the right of the canal, winding in a circuitous course through the meadows and around Johnson's Iron Foundry, one of the well known landmarks of the locality. In the background can be seen the cut through which the New York Central Railroad passes, and a little to its left is the natural depression through which the waters of the creek penetrate. In the far background the Palisades, extending along the further or western banks of the Hudson River, are visible.

The small map shows the line of the portion of the canal the progress of whose construction is illustrated. It also shows the line formerly followed by Dyckman's Creek, now excavated out of existence. The hills of dolomite converging here had to be cut through, comprising practically all the rock cutting on the line. In order to pursue the work in comfort, two dams were constructed, one at each end of the proposed cut. Tongued and grooved sheet piling was driven across the axis of the canal, and by dumping solid earth and rocks back of the piling, its strength was still further increased. Then the excavation of the rock began. It is done by contract. The material is loosened by blasting, and as fast as broken up is hauled out on tramways toward the rear. The blasting agent is forcite, and steam drills are used for making the shot holes. The *debris* is hauled up on the railways to the dump, and is deposited upon ground leased for the purpose. At the base of the hill an engine house is located, whence a cable is carried by which the cars are hauled up the steep incline. Eventually the material deposited on the dump will have to be removed, and it is unquestionable that much valuable building material can be procured therefrom.

A great part of the excavation has been worked down to the grade level of the bottom of the canal, which plane is shown in the large illustration. When completed, it will present a channel 18 feet deep at mean low water and varying from 350 to 400 feet wide. The law of May 20, 1879, provides that all bridges hereafter to be constructed over this channel shall be at right angles to its courses, and that the bridges at the draws shall not be less than 24 feet above high water of spring tide, and that no tunnel shall be constructed under it which will not permit the excavation of a 20 foot channel. Other restrictions are also imposed, applying to the Harlem River and canal. When the work is completed and when the Harlem River channel shall have been adequately dredged out, a very important addition will have been made to the water front of the city. At present the Harlem River is practically limited for navigation to the point marked by the High Bridge. When dredged out, however, and when this canal shall have been completed to the Hudson River, a clear waterway will be provided for all vessels able to pass through the many draws and under the High Bridge. In transit from the North River to the Sound this route will cut off a distance of 10 or 12 miles. One of our illustrations shows in bird's eye view the new connecting link between Long Island Sound and the Hudson River which it will form when completed. Owing to the numerous bridges, however, the utility of this waterway as a through route will be limited to small sailing vessels, steamers, and barges. There is little doubt that for such traffic it will be very largely used, but the immense water front which will be developed by it, and the facilities it will provide for the delivery of coal and building materials to the upper part of the city and to the annexed district, will be the most important features of the improvement.

A number of railroads cross the Harlem and Spuyten Duyvil Creek. Over the three railroad bridges at present existing four separate railroads send a large number of trains daily. The use of these bridges will of course be greatly interfered with if the draws have to be frequently opened. It is therefore seen that in the near future some change will have to be made in this respect. The bridges should either be raised so as to admit the passage of small steamers and barges, or tunnels should be made under the river for the passage of trains. Based on the interference with the railroads crossing these bridges, objections have been made to continuing the work now so far advanced, on which already about $200,000 has been expended. To yield to such objections would be a shortsighted policy. But the fact of such a feeling having arisen emphasizes the necessity for the construction of an adequate railroad tunnel under the Harlem River at 4th Avenue, for the passage of trains of the Harlem, New York Central, and New Haven roads.

Our thanks are due to Lieut.-Col. George L. Gillespie for facilities afforded by him. We have also to acknowledge the receipt of many courtesies from Mr. A. Doerflinger, the assistant engineer in charge of the work.

Rapid Method for Dental Gold Plates.

At the recent International Dental Congress, Paris, Dr. Michaels, of Paris, read an article on "A Rapid Method of Making a Gold Plate," followed by a practical demonstration. In half an hour he made a gold plate of four teeth, the time for the setting of the plaster not being counted. The author uses a special gold plate, which is very thin and pliable; it can be worked like sheet lead. This sheet gold is smooth on one side and quadrilated or roughened on the other. A good impression must be obtained with gutta percha. In this impression he runs a mixture of two parts plaster to one of sand, and obtains a model about an inch in height. He then adjusts on this model the teeth as well as the clasps. When a clasp is well adjusted, he tightens it somewhat, and pushes it with force into its proper position, so that it cannot be displaced. When the clasps are in place, he takes a piece of sheet lead and cuts it according to the shape he wants to give to the piece, and having marked the upper surface, he places it on the gold plate described above, and cuts a piece out according to the pattern.

He then takes this piece of gold and places it in position, the smooth side of the plate in contact with the plaster while the roughened or quadrilated surface looks upward. This is adjusted into position with a good burnisher or other similar instrument. To retain this plate in position he drives little nails about half an inch in length by the side of it into the plaster, and with a pair of pincers he turns the ends of them so that they press on the plaster surface and render the plate immovable. The teeth are then placed again on the model and plate, and retained in position with hard wax. He then invests the teeth and model in a plaster and sand mixture, while the wax is washed off with boiling water. Of course, the whole upper quadrilated or roughened surface must be left exposed, as it is by running solder all over this plate that he obtains the desired thickness. When the plaster is dried, all the spaces that may be left between the plate and backings of teeth or clasps are filled with small scraps of platinum foil made into pellets and pushed into position. After the whole surface and backings have been well covered with borax, the piece is ready for soldering.—*Dental Cosmos.*

Correspondence.

Diminutive Electro-magnets.

To the Editor of the Scientific American:

Some of your readers may be interested to know how to make small electro-magnets at very little cost, which work well for home-made telegraph sounders, circuit breakers, etc.

If they will file off the head and point of a 2½ inch wire brad and hammer it into the shape of a horseshoe, they will have the core. This is then to be wound with two layers of No. 30 cotton-covered wire. The whole operation should not take more than five minutes, and the magnet, used with one Grenet cell, will sustain about an ounce. These magnets, moreover, cannot cost more than a fraction of a cent apiece, if made in any quantity, and might be sold for five or ten cents. Finally, considering their size (about that of a large thimble), they are extremely portable and astonishingly strong. DANIEL GREGORY MASON.

Boston, Mass.

Sound Signals for Steam Vessels.

Jas. A. Dumont, Supervising Inspector-General of Steam Vessels, in a recent circular calls the attention of pilots of steam vessels to the frequent collisions occurring through failure to observe the pilot rules laid down by the Board of Supervising Inspectors, whereas if such rules were strictly observed, collisions would be almost absolutely impossible.

The main causes of collisions result from the failure of pilots to consider Rules I. to VII., inclusive, in strict connection with Rule III. of the Pilot Rules for Lakes and Seaboard, which rule reads as follows:

"Rule III. If, when steamers are approaching each other, the pilot of either vessel fails to understand the course or intention of the other, whether from signals being given or answered erroneously, or from other cause, the pilot so in doubt shall immediately signify the same by giving several short and rapid blasts of the steam whistle; and if the vessels shall have approached within half a mile of each other, both shall be immediately slowed to a speed barely sufficient for steerage way until the proper signals are given, answered, and understood, or until the vessels shall have passed each other."

The rule quoted qualifies all the others, and is the only qualification that can be permitted with safety when steamers are meeting in such positions as to render collisions possible. There is no authority in the rules and regulations for vessels approaching each other from opposite directions for what has become technically known among pilots as "cross signals"—that is, answering one whistle with two, and answering two whistles with one. In all cases, and under all circumstances, when a pilot receiving either of the whistle signals provided in the rules, which for any reason he deems injudicious to comply with, instead of answering it with a cross signal, as is now so much the custom to do, it is his imperative duty to at once observe the provisions of Rule III., namely, give the alarm signal whistle and at once slow his engine and reduce speed to bare steerage way; and the opposing vessel, immediately on hearing the alarm signal whistle, should also slow down, and stop if necessary, till the danger of collision is passed.

In investigating collision cases, inspectors of steam vessels would be justified in considering any pilot who gives a cross signal instead of complying with Rule III. *prima facie* guilty of neglect of duty. So, also, of the pilot giving the first signal, who fails to slow or stop his boat immediately after he discovers his signal whistles are answered otherwise than as given by himself.

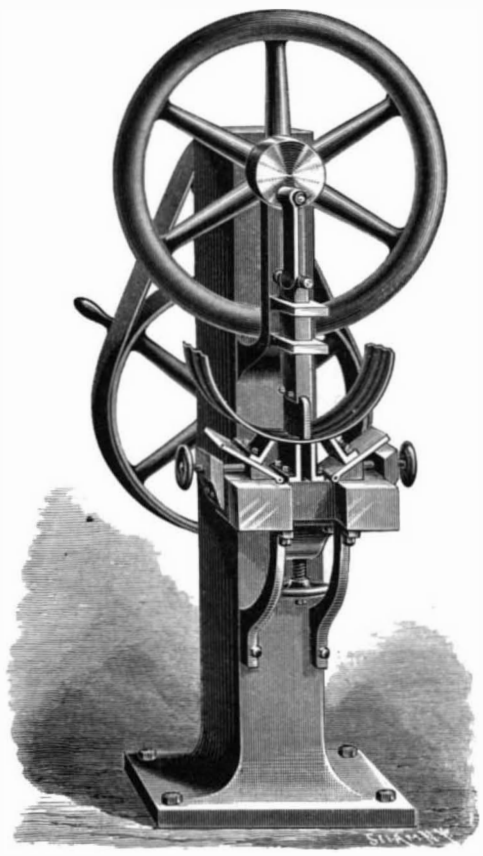
Rule II. of the Pilot Rules for Western Rivers has the same application to those rules that Rule III. of the Pilot Rules for Lakes and Seaboard has to the latter rules, and it must be observed in the same manner. It is desirable that all pilots should thoroughly understand that when whistles are blown as passing signals, it is a rule, never to be deviated from, that one whistle means that the vessels giving such signal is or intends porting her *helm;* two whistles, that the vessel giving it is or intends putting her *helm* to starboard.

Danger from Unclean Instruments.

Prof. Lancereaux brought before his clinic a man who exhibited a papulo-pustular eruption over the entire body. The cervico-occipital glands were enlarged, and showed all the signs of a syphilitic adenitis. The cause of the infection was a catheterism of the Eustachian tube. Another case was that of a lady who, a few weeks after some operation on her teeth, had an indurated ulceration of the gums, followed by a diffused eruption and indolent engorgement of the glands, as well as by painful periostitis over the bones of the skull and forearm. In both cases antisyphilitic treatment restored the patient to health. Dentists, barbers, and hair dressers should also take care to keep their instruments aseptic, as syphilis has been communicated by them, as well as by the physician and surgeon.—*Bull. Med.*, 88, 1889

BENDING AND EMBOSSING SHEET METAL.

A machine for simultaneously bending and embossing sheet metal plates, such as used for cornices, metal shingles, etc., is shown herewith, and has been patented by Mr. Benjamin J. Baldwin, Jr., of Paris, Texas, the illustration showing a plate of metal being shaped by passing it between the dies. In a table held on the front of a suitably constructed frame is an aperture in which is a vertically adjustable block supporting two vertical die plates, a short distance from each other, which may be moved



MACHINE FOR BENDING AND EMBOSSING SHEET METAL.

transversely and secured in place by bolts passing through slots in their flanges. On the outer side of these die plates are arranged similar plates inclined toward the vertical plates, and resting on adjustable wedges, whose position is fixed according to the radius to which the sheet metal is to be bent. Above and between the central vertical die plates is adapted to slide a reciprocating die, having its under side formed to the shape of the upper ends of the lower die plates, the reciprocating die being secured on a slide whose upper end is pivotally connected by a pitman with a crank disk on the outer end of a shaft on which is a fly wheel, the driving wheel being operated by hand or other power. In the rear of the meeting faces of the dies is held an adjustable gauge plate, serving as a stop against which the edge of the sheet metal being operated on is held, thereby permitting any number of pieces to be uniformly bent and embossed

Paper Pillows.

The latest fad in England is paper pillows. The paper is torn into very small pieces, not bigger than the finger nail, and then put into a pillow sack of drilling or light ticking. They are very cool for hot climates, and much superior to feather pillows. The newspapers are printing appeals for them for hospitals. Newspapers are not nice to use, as they have a disagreeable odor of printer's ink; but brown or white paper and old letters and envelopes are the best. The finer the paper is cut or torn, the lighter it makes the pillow.

Fire in a Steam Heated Car.

It has been thought that the heating of the cars by steam from the locomotive would do away with the risks of fire in railroad trains. But the passengers on a Boston and Maine car running between Reading and Boston a few days ago were startled by the sight of smoke near the center of the car. An examination showed that there was fire beneath the floor, and it was found necessary to cut away a part of the floor in order to extinguish it. The valve by which steam was admitted or excluded was near the place where the fire was found. It is probable that a surplus of oil had been used about the valve, and the oil, aided by the warmth from the steam pipes, doubtless caused spontaneous combustion. The discovery of this fire will probably lead to the adoption of new precautions, especially in regard to the use of oil about the steam pipes and valves.

Iceberg Dust.

One of the most interesting contributions of Prof. Nordenskjold to popular science is his examination—when about 80° N. lat., before reaching Parry's Island, to the northwest of Spitzbergen—of the snow which covered the icebergs, and which had come from still higher latitudes. He found it strewn with a multitude of minute black particles, spread over the surface or situated at the bottom of little pits, a great number of which were to be seen on the outer layer of snow; many of such particles were also lodged in the lower strata. The dust, which became gray on drying, the professor found to contain a large proportion of metallic particles attracted by the magnet, and capable of decomposing sulphate of copper. An observation made a little later upon other icebergs proved the presence of similar dust in a layer of granular cystalline snow situated beneath a stratum of light fresh snow, and another of hardened snow. Upon analysis, Prof. Nordenskjold found this matter to be composed in varying proportions of metallic iron, phosphorus, cobalt, and fragments of Diatomaceæ.

Wages in Germany.

Statistics recently collected show that machine makers and workers in metal receive the highest average rate of wages in Germany. This average is for adults 26·66 marks a week at Barop, in Westphalia, 22 marks at Mannheim, and 21 marks at Berlin, Ingolstadt, Spandau, and Styrum. This is for day labor. For piecework, the highest average was 30 marks, at Wandhofen, in Westphalia, 28 marks at Augsburg and Styrum, and 27 marks at Spandau and Weissenfels. Next in order come the factory hands, with 24 marks at Stassfurt and 22·50 marks at Essen. Joiners receive the highest wages in Berlin, Leipsic, Lindenau, and Mannheim, the average being 18 marks a week for day labor. The average for day labor is 27 marks a week for potters and glass makers at Rehau, 19 marks for shoemakers at Friedrichshaven, and 18 marks for tailors at Dortmund. Bricklayers are paid 30 marks at Berlin. A mark is equal to 23·8 cents of our money.—*Pottery Gazette.*

SENDING PICTURES BY TELEGRAPH.

Mr. H. Rickinson, of 13 Wellington Street, Islington, London, N., is the inventor of a system of transmitting sketches by telegraph. The advantages of such a method of communication lie in its applicability in time of war to telegraphing the position of an enemy, etc. It would also be useful in tracking a criminal, for his portrait could be transmitted rapidly from place to place. The method of working will be understood from the illustrations in conjunction with the table. The original sketch, Fig. 1, is divided up into squares by means of ordinates and abscissæ, and each square is identified by the letters which are ranged along the sides of the chart. Each of these squares is again divided into five parts, which are identified by the numbers 1, 2, 3, 4, and 5, and each such part is divided into two, and half the part is denoted by the letter *j*. Any point in the picture thus has two co-ordinates, as in analytical geometry, and these co-ordinates are communicated by telegraph. A broken line is, of course, identified by a number of points taken along it. When the sketch has been reproduced by joining the points constituting the lines, the details may be filled in by the aid of the descriptive words added. The diagrams and table of the telegraphic message so fully explain the method that further comment is unnecessary. It may be of interest to add that the scene depicted in the specimen illustration is a view from Whitby Harbor.—*Industries.*

A3R3—A5R1—B1R1—B2Q4—B4Q1—B4jQ1—B5P5—B5jP5—C2Q1—C4Q1—C5P5—D2P4—D3P2—E1O5—E2P5—E2Q1—E3Q8—E3Q5—E5R2—E5R3	Foreground cliff.
D3P2—D3O3—E1O2—E1O5	Stone ramparts (circular)
D3O3—D2O3—D2M5j—D5jM5—D5jO2, D2N1—D1N1—C5jN1j—D1N2—D2N2	Watch houses (circular).
D2O1—D1O1—C5jO1j—D1O2—D2O2	Flag staff.
D2N3—C2N3—C2jN3j, C4N2—C3N4	Stone pier.
D2jM5j—D2jH5—D2H5—D2G5—D5G5—D5M5	Light house.
D2H3—C3H3—C2H3j—C3H4—D2H4	Horizon.
C3jH2j—C3jH4j	Water line.
D4G5—D4G1	Boat.
D5M5—E1M3—E3M1—E5L5—F2L3—F4K5—F5K4	Distant cliff.
E5K3—E4jI5—E5I4—E5K3—E4L2—E4L3—E5L3—F1L2j—F1I5—E5I4	Abbey.
B5jP5—B5jN2—C1M2—C1L3—C2L2—C5jL1—D1K4—D2jK3	Windows.
B5jN2—B2N2—B3N2j—B1jN3j—B3N4j—B2N5—B3jN5—B3jO2	Church.
B4N3—B3N3..., B4N3j—B2jN3j, B4N4—B3N4...	Lower ledge.
B5jO2—B2jO2—B2jO4—B3jO4—B3jP2—B5jP2, B2jO3—B1jO3	Old houses.
C5P5—C5L5—D1K4—D2jK3	Seagull.
C5N4—C4jN4—C4N4j—C4O1j—C3O2—C3P2—C3jQ1	
B2K5—B3L1—B2jL2	

TABLE OF TELEGRAPHIC MESSAGE CONNECTED WITH CHART.

AN IMPROVED MILL BOOT OR PESTLE.

The illustration herewith represents a boot or pestle mainly designed to be used in mills driven by power for pounding rice, the principal view showing a double pestle mill fitted with such a boot or pestle, of which the small figure gives a perspective view. The invention has been patented by N. B. Tilton, Upper Rice Mill, Savannah, Ga. The pestles are adjustable up or down on their stems by means of nuts fitting on screw threads on the stems, to regulate the pounding action of the pestles, whereby the rice grains are more perfectly agitated and made to clean one another. The stems, which work through the bottom of the mortars, are connected below with sliding crossheads reciprocated by connecting rods worked by crank disks on a shaft, the cranks being set opposite each other, so that as one pestle is moved up the other will be moved down. At or near the base of each pestle is a flange which, as the pestle rises, carries up some of the rice from the bottom of the mortar, thus keeping the rice in motion, while all packing is avoided.

TILTON'S MILL BOOT OR PESTLE.

The Planet Mercury.

If it be true that the rotation period of Mercury is the same as that of its revolution around the sun, and this does not seem to be at all unreasonable, what strange conditions of affairs must exist upon that planet! One hemisphere in perpetual day, the other in everlasting night! One in perpetual heat, the other in intense and never-ceasing cold! At one point upon the sunward hemisphere the sun is in the zenith, oscillating 23° 41′ alternately to the east and west, at others alternately above and below the same point of the horizon, during the period of 88 of our days. Many interesting, although of course useless, questions present themselves to one's mind in contemplating these conditions. Are there living intelligent beings there? On what part of the globe do they live? How do they measure time?—*Sidereal Messenger.*

Weighting of Silk.

The process of weighting silk by tin salts has been recently described, but this is from another source: The bichloride is reduced by water to 30° B., which is the strongest solution that can be employed with safety, stronger would be likely to injure the fiber; at 34° B. the silk becomes rough and valueless, at 40° B. the fiber is dissolved. The silk is well worked in the solution until perfectly saturated, left two hours in the liquor, taken out and washed. One dip adds about eight per cent to the weight, three treatments give an increase of about 25 per cent. Bare hands must not be used in working the goods in bichloride of tin at 30° B.; it acts injuriously upon the skin from its strong acidity. The silk must be very well washed before it is soaped; any of the tin solution left in would decompose the soap.—*O'Neil.*

Keep Busy.

The secret of success in life is to keep busy, to be persevering, patient, and untiring in the pursuit or calling you are following. The busy ones may now and then make mistakes, but it is better to risk these than to be idle and inactive. Keep doing, whether it be at work or seeking recreation. Motion is life, and the busiest are the happiest. Cheerful, active labor is a blessing. An old philosopher says: "The firefly only shines when on the wing; so it is with the mind; when once we rest, we darken."—*Elmina.*

A Relic of Engineering of Many Centuries Ago.

How many of the engineering works of the nineteenth century, says a recent writer, will there be in existence in the year 6000? Very few, we fear, and still less those that will continue in the far-off age to serve a useful purpose. Yet there is at least one great undertaking conceived and executed by an engineer which during the space of four thousand years has never ceased its office, on which the life of a fertile province absolutely depends to-day. We refer to the Bahr Joussuf—the canal of Joseph—built, according to tradition, by the son of Jacob, and which constitutes not the least of the many blessings he conferred on Egypt during the years of his prosperous rule.

This canal took its rise from the Nile at Asiut, and ran almost parallel with it for nearly two hundred and fifty miles, creeping along under the western cliffs of the Nile valley, with many a bend and winding, and at length it gained an eminence, as compared with the river bed, which enabled it to turn westward through a narrow pass and enter a district which was otherwise shut off from the fertilizing floods on which all vegetation in Egypt depends. The northern end stood seventeen feet above low Nile, while at the southern end it was at an equal elevation with the river. Through this cut ran a perennial stream, which watered a province named the Fayoum, endowing it with fertility and supporting a large population. In the time of the annual flood a great part of the canal was under the water, and then the river's current would rush in a more direct course into the pass, carrying with it the rich silt which takes the place of manure and keeps the soil in a state of constant productiveness.

All this, with the exception of the traditions that Joseph built it, can be verified to-day, and it is not mere supposition or rumor. Until eight years ago it was firmly believed that the design has always been limited to an irrigation scheme, larger, no doubt, than that now in operation, as shown by the traces of abandoned canals and by the slow aggregation of waste water which had accumulated in the Birket el Querun, but still essentially the same in character. Many accounts have been written by Greek and Roman historians, such as Herodotus, Strabo, Mutianus, and Pliny, and repeated in monkish legends or portrayed in the maps of the middle ages, which agreed with the folk lore of the district.

These tales explained that the canal dug by the ancient Israelite served to carry the surplus waters of the Nile into an extensive lake lying south of the Fayoum, and so large that it not only modified the climate, tempering the arid winds of the desert and converting them into the balmy airs which nourished the vines and the olives into a fullness and fragrance unknown in any part of the country, but also added to the food supply of the land such immense quantities of fish that the royal prerogative of the right of piscary at the great weir was valued at $250,000 annually. This lake was said to be 450 miles round, and to be navigated by a fleet of vessels, and the whole circumference was the scene of great national industry and prosperity.

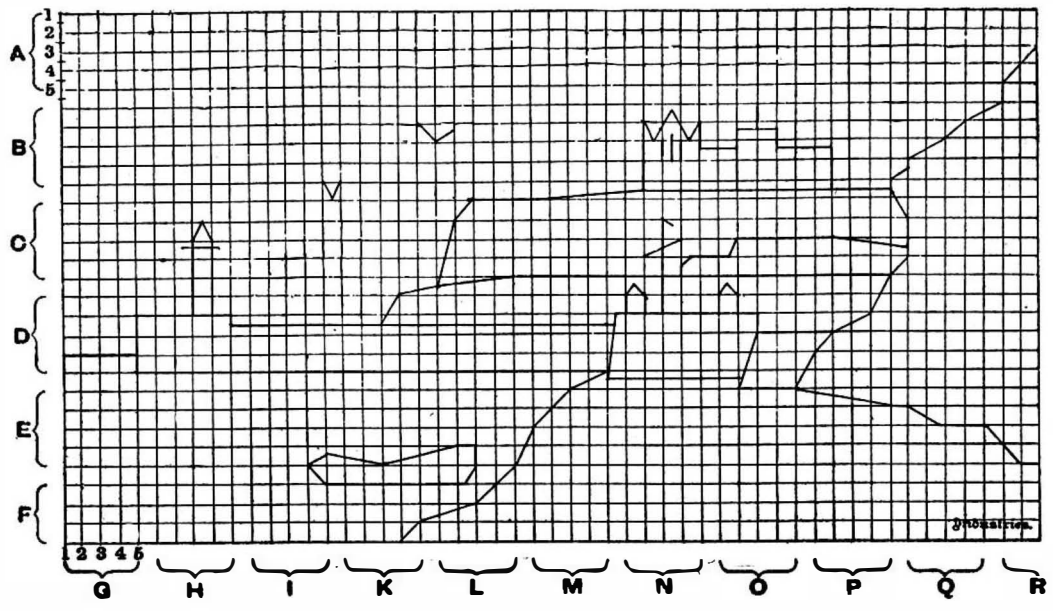


Fig. 1.—CHART FOR LOCATING THE POSITION OF LEADING POINTS IN PICTURE.

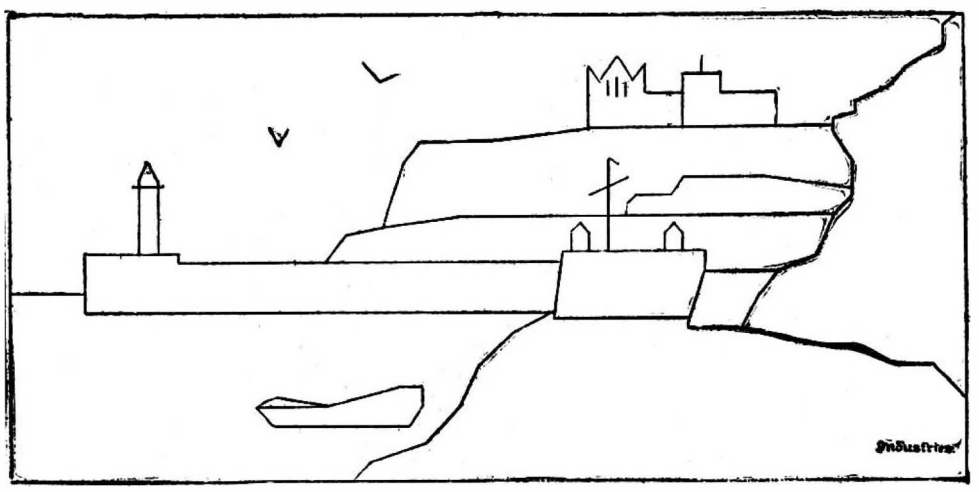


Fig. 2.—ROUGH OUTLINE OF SKETCH TAKEN FROM CHART.

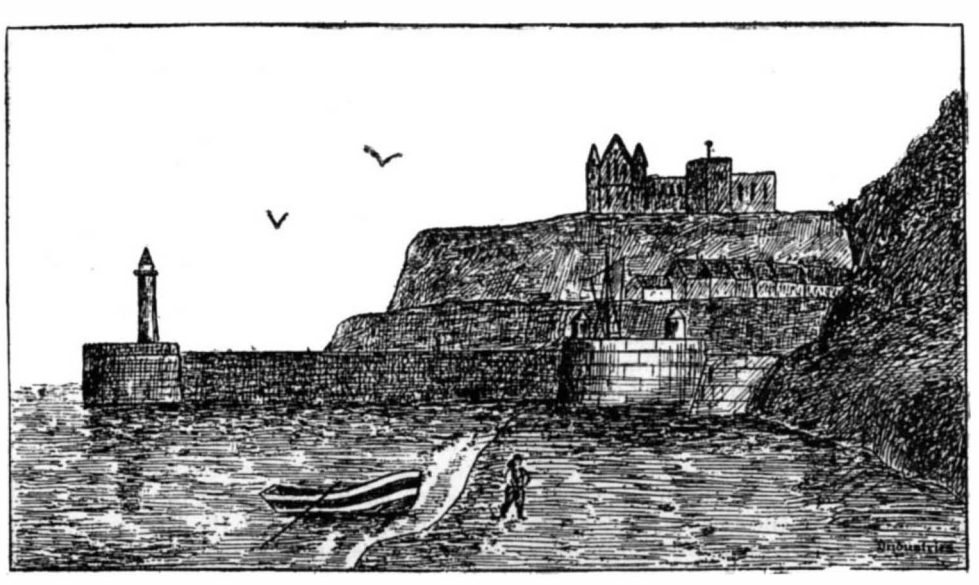


Fig. 3.—COMPLETED PICTURE SHADED IN ACCORDANCE WITH MESSAGE.

Standard Torpedo Boats.

Messrs. Yarrow & Co. have recently completed six first-class torpedo boats of what is now reckoned the standard type. The boats are of galvanized steel, and are 130 feet long and 13 feet 6 inches broad. Their triple expansion engines will indicate about 1,150 horse power, and, with a load of 20 tons on board, will drive the craft at a maximum speed of rather over 23 knots, or nearly 26½ miles an hour. The boiler is of the locomotive type, and forced draught is not used. The accommodation, both for officers and for men, is marvelously good. The turning capacity is extraordinary, for these boats, without heeling over in the least, can turn at full speed and in 75 seconds in a circle of some 300 feet in diameter.—*Army and Navy Gazette.*

Cocoanut Butter.

A new kind of butter is now being made in Germany from cocoanut milk. The Calcutta correspondent of the London *Times* says that the cocoanuts required for this industry are imported in large numbers from India, chiefly Bombay, and that the trade seems likely to attain still greater importance. When this new industry takes root here, another act of Congress will be required to protect the makers of the dirty milk butter with which our markets are flooded.

Telephone Conductors.

Sir William Thomson, in the course of an article on "Electric Lighting and Public Safety," published in the current issue of the *North American Review*, says that it may be considered as definitely resolved that the distribution of electric energy for light and power in towns of Great Britain shall be by underground conductors, and that the post office telegraph department has already replaced nearly all the aerial telegraph wires of the larger cities by underground conductors.

Sir William continues: "The telephone wires alone remain in the air, long may they hold their place there, they are perfectly harmless to the general public, and they are enormously less expensive where they are than they could be if placed underground."

Towing without a Rope.

As an instance of negative hydraulic pressure or relative vacuum in the wake of a moving vessel, the following extract from Mr. P. G. Hamerton's yachting tour on the Saone, says the *Engineer*, is interesting. The small sailing yacht or "catamaran" Arar is a double boat, built on the principle of the Calais-Douvres. Returning against the stream in the wake of a huge barge towed by a small steam tug, Mr. Hamerton remarks:

"On drawing the Arar close to the barge, I found the motion less fatiguing, but the curious thing was this—the Arar now followed without a hawser. There was, in fact, no necessity for a rope, as our boat was propelled by the back water behind the barge. The Arar kept the noses of her two hulls at a distance of about three inches from the stern of the boat before her, and that with marvelous steadiness. For some time the two hawsers hung idly in festoons, but they were entirely detached before we came to the bridge at Macon, yet the Arar followed under the arch against the general current of the river, though, in reality, on the rapid countercurrent of the back water. How can a steamer tug a small boat without either increase of power or diminution of speed? The question appears insoluble, yet here is a solution of it—the steamer's motion may create a back water behind a flat-sterned barge that she is towing, and the small boat may follow on the back water without imposing the slightest extra tax upon the tug."

Mr. Hamerton omits to notice that the negative pressure at the stern of the barge may have been increased by the deviation of the back water past the sides of the Arar; but he is perfectly right in stating that, but for the presence of the yacht, this negative back pressure would for the most part have represented a loss of power.

Coagulants and Non-Coagulants.

At a recent clinic given at the New York Dental College, Dr. A. W. Harlan, Chicago, Ill., demonstrated the action of coagulants and non-coagulants on egg albumen. These experiments, says the *Dental Cosmos*, were undertaken to show, first, the coagulating properties of carbolic acid, creosote, resorcin, alcohol, peroxide of hydrogen, chloride of zinc, 1 to 1,000 solution bichloride of mercury, guaiacol, aromatic sulphuric acid, and synthetic carbolic acid, also to demonstrate the non-coagulating properties of the following named drugs: Oil of cassia, oil of gaultheria, oil of camphor, oil of cajeput, tereben, myrtol, eugenol, oil of cloves, eucalyptol, ethereal solution of iodoform, terpinol, oil of sassafras, and a few others. Dr. Harlan stated that non-coagulants were the ideal medicaments to be used for disinfecting pulpless teeth, on account of their non-coagulating properties. When introduced into the root canal, they would not cook a serous exudate, or pus flowing from a blind abscess into the canal, whereby the delicate canals would be filled with cooked albumen, clogging them and preventing the introduction of fine instruments. When a coagulant is used under such circumstances, albuminous matters, filling the root or draining through the root, are inevitably cooked at once, thereby rendering the removal of the coagulated albumen from the delicate canals a matter of impossibility. This was very satisfactorily demonstrated by experiments made before the spectators, and in every case where non-coagulants were used, it was shown that they remained in contact with the albumen product without any coagulating effect.

CANNOT some inventor contrive a street cleaning machine which shall do more than simply brush the dirt to one side or the other of the street and leave it in windrows? There is demanded something which will take the dirt up bodily and put it into a box to be carried with it until the machine has reached the end of the route or the box is full.

Lead Poison in Water.

Lead poisoning having occurred at Dessau in 92 cases, a commission was issued to discover the cause, which was immediately traceable to the water supply. It then became necessary to ascertain whether the water was originally poisonous; but it was soon found to have acquired this quality in the course of distribution through the lead service pipes used in the town. Experiments showed the water to be extremely soft; and when its hardness was increased by the addition of finely powdered limestone, it ceased to corrode lead. Further inquiry demonstrated that it was not the hardness that rendered the water innocuous, but the deprivation, by agitation with the limestone, of the carbonic acid originally contained in the water, and which attacked the lead. To permanently cure the evil, an apparatus has been set up at the water works to mix automatically a definite quantity of powdered limestone with a certain proportion of the water passed through the works. The mixture is then, after agitation, returned to the bulk of the supply; and the result is a complete cure of the mischief—not a single case of lead poisoning having occurred since the apparatus was set in regular operation. The quantity of powdered limestone required for this service at Dessau is about 200 cubic centimeters every two minutes.

Hindoo Magic—the China Duck Trick.

In 1878 I was stopping in the city of Allahabad, near the center of India, on the Indian Peninsular Railway, giving performances in the Railway Theater, says a traveler. Every day a party of native jugglers were in the habit of visiting our hotel and exhibiting their skill on the plaza in front of the building. One day I was particularly attracted by an old Hindoo, his son, and daughter, who squatted down on the ground and waited for the crowd of sightseers to gather round. They did not have long to wait. When enough spectators had come to make the performance profitable, the old fellow drew from the bag that all Indian jugglers use to convey their "properties" in a small earthenware jar filled with muddy water. He first sprinkled a few drops of water on the ground and then placed the jar upon three small stones, which he also took from the bag.

He then produced a small china duck and gave it to me for inspection. I found nothing noticeable about it. He asked me to put it in water. I did so, and it immediately sank to the bottom. He next drew from the bag a small tom-tom, a little musical instrument that emits a drumming sound when the handle is turned, and began waving it around the jar. Instantly the duck arose to the surface. He told me to touch it. I tried to do so, when the bird again disappeared, to reappear again and again at the juggler's will. I must confess that I was mystified. There was apparently no cause for the strange actions of the little bird. It was only after the third or fourth visit of the conjuror that I discovered the secret of the trick.

It was a particularly bright, sunny day, and I had chosen a place among the spectators slightly nearer than the others were allowed. I was behind the scenes, as it were. While attentively watching the trick, I noticed in the sunshine the sparkle of a long hair that extended from the tom-tom to the bottom of the jar. The moment I saw this I divined the juggler's secret, and I afterward found that my theory was correct. The jar already contained a china duck precisely similar to the one I had examined, save that it was buoyant. Attached to the breast of this duck was the hair. This hair came through a tiny hole in the bottom of the jar. The water was sprinkled on the ground to conceal any leakage. When the jar was placed upon the ground, the hair was fastened so that the duck could not rise to the surface.

As the juggler picked up his tom-tom it was an easy matter for him to fasten the end of the hair to it by means of a bit of wax. After this was arranged you can see how easily he was able to make this counterfeit duck bob up and down at the word of command.—*Pottery Gazette.*

Exploration on Greenland.

The *Frankfurter Zeitung* publishes a letter from its Copenhagen correspondent, stating that a new expedition for exploring Greenland will start next summer from Denmark. The plan of work has been arranged by the naval lieutenant Ryder. The party will consist of nine persons, with three boats, and a steamer to convey them to the eastern coast as soon as the condition of the ice will allow of a landing. It is proposed to explore in the course of the summer the region lying between 66° and 73° north latitude, pushing as far as possible into the interior. Sleds will be employed during the winter, going over as much ground as possible. The expedition will be provisioned and equipped for two years, at the end of which time the steamer will return to take them away, cruising along the east coast till they get down to the shore. The expenses have been estimated at about $80,000, and the project is so popular, and looked on so favorably by the government, that it is practically certain that the Diet will grant the money.

How the Work of the Clearing House is Conducted.

As many are entirely unfamiliar with the detail of the work carried on at a great clearing house like that of New York, we print below an article in full upon that subject, by George O. Brown, in the New York *Star:*

There is situated at the corner of Pine and Nassau Streets, within a stone's throw of the New York Stock Exchange, an unpretentious brownstone building, known to very few outside of bank messengers and clerks, and possibly a few business men. At certain hours of the day, however, should one take the trouble to climb a long, winding flight of stone stairs, a scene as busy as anything ever witnessed on the floor of the Stock Exchange presents itself.

Should the visitor be fortunate and gain admittance beyond the heavy swinging doors and the attendants, he finds himself at the end of a large, well-lighted room, divided into sections by tall wire screens. Long rows of high desks extend the length of the room, and these desks are also separated by screens.

At each portion of the desks so divided stands a clerk whose sole object in life seems to be to add up a seemingly endless column of figures as rapidly as possible. The scratching of pens and the rustle of crisp Treasury notes, varied now and then by the rattle of silver or gold coin, are the only sounds to be heard.

At the opposite end of the room, on a high platform, from which he can overlook the entire room and its army of workers, stands a shrewd, "business-looking" man with a number of assistants, also busy on long columns of figures.

Such is the daily scene at the New York Clearing House during the time from 10 o'clock until 11 or 11:30. The clerks at the desks in the room are representatives of all the banks in the city, and the man who is on the platform, keeping a general oversight over all the work and noticing each detail, is Mr. W. A. Camp, the manager of the Clearing House.

This association of banks is a comparatively new institution, being only about thirty-six years old; but so rapid has been the increase of business in New York City, that to-day the New York Clearing House is the largest institution of its kind in the world—greater even than the Bank of England.

When the Clearing House was first organized in 1853, there were in the association fifty-five banks, and for the year ending September 30, 1854, the daily exchanges averaged $19,104,504.94. At the present time there are sixty-four banks in the association, and last year the daily average of exchange at the Clearing House was $101,192,415.11. So, during the time which it has been in existence, the total exchanges amount to $843,806,456,478.62, and the total transactions amount to $881,135,273,210.16. In order to form some idea of how vast this amount is, it may be stated that it would take nearly six thousand years to count it, at the rate of two hundred and forty a minute, day and night.

The largest transaction for any one day through the Clearing House amounted to $295,822,422.37, and the smallest daily transaction was $8,300,694.82. So large are these figures, however, that one can scarcely realize the amount of money which they represent, and yet, to the credit of the management of the Clearing House, be it noted that since the first day when it opened for business, so much as a penny has never been lost, nor has a mistake ever occurred.

One quite naturally asks how all this business is transacted during one or, at the most, two hours daily, making exchanges of notes, bills, and drafts between the eighty-odd banks in the city, and never a mistake made. The answer is simple enough, and the work appears quite easy when one really knows exactly how it is done.

In the first place, each bank in the association sends two representatives to the Clearing House promptly at 10 o'clock each day, the few banks not in the association making their exchanges through some bank belonging thereto. When all the clerks are in their places in the big hall of the Clearing House, exactly at 10 o'clock the manager comes in, and a gong sounds the signal that work is to begin at once.

One clerk from each bank is known as a settling clerk, and the second as the delivery clerk. It is the duty of the settling clerk to receive from the delivery clerk from each of the other banks whatever exchanges there may be on his own bank—drafts, notes, checks, etc. When the various delivery clerks have handed to the settling clerks of other banks all outstanding items, the settling clerk records them as received, crediting each bank with its proper amount. A proof of this sheet is then delivered to the proof clerk, as are also little slips from each bank showing exactly the amount which it has sent to the Clearing House. These tickets, known as credit or debit tickets, as the case may be, should, and always do, as a matter of fact, balance.

In case an error is made by some clerk in recording the amount received from or paid to some bank, the slip at once shows where the mistake is, and a correction ticket is at once sent to the proof clerk, who rectifies the error. So rapidly are the exchanges made that it takes only about ten minutes for the delivery clerks to make the entire rounds, thus practically having visited every bank in the city, and making the necessary exchanges, and over four thousand packages of checks have been distributed and receipted for by the proper representatives of the banks.

After the exchanges are all made and the proofs are found correct, the delivery clerk takes each to his own bank the amount received in exchange, while the setling clerk remains to complete his proof sheet and compare it with that of the proof clerk on the platform, who works under the direct supervision of the manager. Thus within an hour work has been done which, before the institution of the Clearing House, used to occupy three and four hours daily, and afterward, as business increased, used to be done only once a week.

Under the present system, each bank has deposited as a fund in the Clearing House an amount proportionate to its capital, thus enabling each bank to make its exchanges at once and in the Clearing House. The greatest balance resulting from any one day's transaction at the Clearing House amounted to $12,505,134.15. The greatest amount of exchanges ever made through the institution in any one day by any one bank was $31,772,391.51. The least balance paid by the Clearing House to any one bank was ten cents, and the least balance paid to the Clearing House by any one bank was paid on September 22, 1862, when a certain city bank scrupulously sent around and paid a balance of one cent.

At one time gold was largely used in payment of settlement of balances, and on November 11, 1879, the sum of $8,315,000 in gold, weighing about fifteen and a half tons, was received in payment of balances; but since the latter part of 1882 the government has issued gold certificates, so that now there is very little gold coin received in settlement.

There are clearing houses in all the principal cities of the United States, doing a yearly business amounting to over $52,000,000,000, while the total amount done by English clearing houses is about $38,000,000,000. As showing what an amount of money is represented by the New York Clearing House, the amount of money handed through that institution during the past year was over $33,000,000,000, while the London Clearing House did over a billion of dollars less business.

Such is a brief outline of the work which is done each day through this institution, and shows in a measure the most complete system of banking exchange in the world.

Fast Railroading.

A fast run was made on the New York division of the Reading Railroad on March 10. A firm of Philadelphia stock brokers was anxious to send a lot of stock to the New York market, and it was very important that the stock should be in New York before the close of business on the Exchange, as there was a big speculative "corner" in the stock. A special train was arranged for in Philadelphia, and was ready to start within fifteen minutes from the time of the call. The start was made from the Ninth and Green Street Station, Philadelphia, at 11:38 A. M., and the train rolled into Jersey City at three minutes after one o'clock, thus making the entire distance of ninety miles in eighty-five minutes, being in round numbers at the rate of 63½ miles per hour.

On the same day two other very fast runs were made over the Pennsylvania Railroad between New York and Washington. A whole theater company was taken to Washington to give a special performance in the afternoon, and the same train brought the company back to give their regular performance in New York in the evening. The distance is 227 miles, and the trip from New York to Washington was made in 258 minutes, being almost at the rate of 53 miles per hour. The return was made in 259 minutes.

Perils of Winter Railroading among the Mountains.

A great snowslide recently occurred near Wheeler, Col., at what is known as Wall Cut, on the High Line Division of the South Park Railroad, in which two passenger trains came near being swept away. The train going west was running in sections. The first section got stuck in the snow at Wall Cut, and the second section came up with two powerful engines to pull out the first section. Roadmaster Dobbins was standing in front of the head engine, superintending the work, when in an instant an avalanche of snow came down, swooping him away. He was completely covered by the flying mass of snow and carried a distance of several thousand feet, entirely across the river and on to the Rio Grande tracks, where he managed to extricate himself with great difficulty. He was severely injured. The tremendous volume of snow was piled entirely over the four engines, putting out the fires, and completely buried the mail cars, in which was the mail agent, George Roberts, and Baggagemaster Mason, of Denver. It took some time to extricate the men, but neither was injured. Fireman Culbertson was badly scalded.

RECENTLY PATENTED INVENTIONS.

Engineering.

LOCOMOTIVE ATTACHMENT. — Robert L. Stevens, Columbus, Neb. This invention consists of an extensible folding arm, preferably connected to the locomotive tender, for the moving of cars upon adjacent tracks to the one upon which the engine is running, thus avoiding the necessity of backing on to a siding to move such cars.

CIRCULATOR AND FEED WATER HEATER.—Elmer C. Jordan, Sacramento, Cal. A channel is formed in the bottom of the boiler, extending from near the rear end into the leg of the boiler, while a feed water pipe passing through the smoke box discharges into the channel at its rear end, serving to create a complete circulation of the water in the boiler and also heat the feed water.

OIL FEED FOR BURNERS.—Charles T. de St. Aubin and Archibald Y. Comstock, New York City. This invention relates to an apparatus for feeding oil to burners, by forcing the oil, or other liquid fuel of less specific gravity than water, with a uniform pressure, from a tank or receptacle buried below the surface of the ground, and located at any distance from the place of combustion.

Electrical.

TIME ALARM AND ANNUNCIATOR.—Nathan H. Suren, Fort Worth, Texas. Combined with a clock and an electric generator is a series of circuits and alarm devices, with mechanism by which contacts may be formed for each branch of the circuit simultaneously, by which any number of signals can be sent automatically or manually and various signals received through the annunciator.

PRINTING TELEGRAPH RECEIVER.—Henry Mahnken, New York City. This invention relates to printing telegraphs in which two series of characters are printed by two type wheels rotating in different planes, and provides means for securing greater certainty in the action of the escapement and unison mechanism, avoiding delicate adjusting and liability to get out of repair.

Railway Appliances.

CAR WHEEL AND AXLE.—Thomas S. Churchman, Sacramento, Cal. The axle is made with a fixed collar, the wheel being loose on the axle, while a sleeved plate is bolted to the inner face of the wheel, and the collar on the axle is fitted into a recess or bearing formed partly in the loose wheel and partly in the sleeved plate, to enable cars to round sharp curves in the track to the right or left.

Mechanical.

GRINDSTONE TOOL HOLDER. — Alexander H. Dick, Cramer's Hill, N. J. This device has an arm carrying a tool clamp, with a support adjustably mounted on the arm to receive and support the end of the tool, permitting of grinding any desired bevel on the tool, and of moving it transversely across the periphery of the stone, the invention being an improvement on a former patented invention of the same inventor.

WRENCH. — Joseph Tomlinson, Sr., Folsom, Cal. This invention covers an improvement on a formerly patented invention of the same inventor, the parts being so arranged that the jaws will close squarely upon a nut placed anywhere between them.

Agricultural

COTTON PICKER.—James W. Wallis, Birmingham, Ala. This a tricycle cotton harvester, adapted to be pushed and operated by hand power, one or more laborers pushing the machine while another rotates a shaft which operates the pickers, the arms carrying the pickers being attached to a box for receiving the cotton, and this box with its attachments being swung back and forth at right angles to the direction of motion of the machine, carrying the arms and the pickers alternately into and out of the cotton plants.

HAY SLING. — Joseph Unterbrink, Ottawa, Ohio. This is a trip frame latch device to which cords are attached to sustain the load, the cords having knots at their upper ends by which they may be suspended from the slot portion of a plate held by an overhead carrier, to allow the loaded sling to be raised by pulley and then moved to where the load is to be dumped by simply pulling the string of a latch.

Miscellaneous.

FIRE ESCAPE.—Henry C. Rose, Leadville, Col. The mechanism of this fire escape is contained in a casing to be secured in a room below a window, or on the wall just outside, the escape rope being secured to a drum axle, the weight of the person uncoiling the rope, while a brake apparatus regulates the speed of descent, without regard to the weight of the person on the rope, the device being completely automatic and not employing springs or weights.

DRIVING REIN. — Matthew S. Dickinson, Los Angeles, Cal. This invention covers an improvement on a former patented invention of the same inventor, in driving reins for a double team, designed to dispense with the ordinary check reins, pulleys being employed, with short rein sections, connected to the rear ends of the same overdraw, which, while causing horses to carry high heads, will allow more freedom to the animals to stretch out their necks and lower their heads, etc.

TOY BANK.—William R. Christie, New York City. This is a registering bank, to receive pennies, nickels, or other coin, the amount of which received will be recorded and rendered visible from the outer face of the bank, means being also provided for sounding an alarm when a coin is dropped into the bank.

AUTOMATIC GRAIN SCALES. — Henry Earle, Canon City, Col. Combined with a scale beam is a receiving drum having conical ends and divided into two compartments, the drum having diametrically opposite openings, one for each compartment, and the ends of the drum having trunnions by which it is journaled in the beam, the construction being provided with a recording device.

BAKE OVEN.—John Rayney, Brooklyn, N. Y. This is a revolving reel oven, designed to be strong and durable and not sag, while it is compact or shallow vertically to allow its use on a reel of smaller size for pans of like area or capacity than has heretofore been provided, thus reducing the height of the entire oven structure to adapt it to more general use on one floor of ordinary buildings.

MANUFACTURE OF PULLEYS.—Joseph T. Mitchell, Shelbyville, Tenn. This invention covers a method of constructing a section of mould for pulleys, placing the rim and hub patterns in the flask, partially filling between the patterns with sand, placing removable boss patterns on previously prepared spokes, and inserting spokes and boss patterns in the flask with boss patterns abutting the hub and rim patterns, filling the flask above the spokes and boss patterns with sand, and removing the hub, rim, and boss patterns.

BRAKE FOR VEHICLES. — Christoph Wening, Neuendettelsau, Bavaria, Germany. This is an automatic brake adapted for application to a great variety of vehicles, and is normally held out of action on a raising or level ground, but self-applied in going down hill, a draw rod secured to the shafts or pole, and moving in a longitudinal direction, applying the brake blocks to the tires of the wheels with greater or less pressure according to the extent of the declivity on which the vehicle may be traveling.

BARREL TRUCK. — George P. Clark, Windsor Locks, Conn. This truck has three separate supports to receive the chine of a barrel, each provided with a caster, in combination with connecting links pivoted at their ends to the supports, while the front caster is swiveled to enable the barrel to be easily turned and moved in any direction without friction and without straining the truck.

CAN COVER AND LOCK. — George H. Littlewood and Orson D. Phillips, Lisle, N. Y. Combined with a flanged lid is a spring encircling the flange, and means for contracting and expanding the spring, whereby, when the cover is upon the can body, the flange of the cover can be forced to a firm frictional contact with the neck of the can and firmly locked thereto.

CHURN. — Homer G. Cronk, Apopka, Fla. This invention provides a specially formed removable agitator frame located in the cream chamber, with a novel latching bar, the cream receptacle or chamber being pivotally supported, and by dashing agitation of the contents produce butter.

OIL STOVE. — Edward B. Finch, New York City. Two patents in this class have been issued to this inventor, one of which provides for an arrangement of the passages, chambers, and dampers to distribute heat from the center to all parts of the top, which is so constructed as to confine the heat in the center or direct it to the sides, while the other provides an air space and chamber in the lower part of the stove, the air for combustion entering at the base in contact with the oil tank and keeping it cool, while there are transverse air chambers between the burners where the air becomes heated before issuing into the working parts of the stove, these chambers being of special advantage when only one or a part of the burners are lighted, obviating radiation and loss of heat.

TETHER. — Benjamin E. Sergeant, Greensborough, N. C. The tethering stake is preferably made tubular or of gas pipe, and upon it is adjustably fitted a bracket in the shape of a rectangular frame with a lug on its upper end at one side, to which is pivoted an arm holding a tethering pole, the arm being held to bear the pole up to a suitable angle by means of a spring bearing on its under side, and at its other end attached to a lug on the bracket.

CHECKING AND UNCHECKING DEVICE. —Samuel Osborn, Wilton, Conn. This is an attachment whereby the check rein may be slackened or tightened without the driver leaving the seat of the vehicle, the check rein being connected by means of a ring and link with a strap passing to the driver beneath one of the lines, and there being a check hook attached to the saddle on to which the ring on the check rein may be drawn.

FENCE.—George W. Alexander, Holly Springs, La. This is a fence in which only the end posts of a panel enter the ground, there being intermediate posts and cross bars held above the ground, the upper part of the fence being preferably formed of barbed wire, with a bottom plank held just above the ground to prevent small animals getting through the fence.

THEATRICAL APPLIANCE. — Charles Barnard, Stamford, Conn. This invention consists of a pedal wheel vehicle, such as a bicycle or velocipede, to be used on the stage of a theater, and which, while it is mounted and worked by the actor to give the desired scenic effect, is independently slid or drawn over the stage to give to it its required travel.

LANGUAGE GAME. — Effie E. Young, Orange, N. J. This is a game in which a number of cards are used, each having a word of a language printed on one side and the phonetic equivalent of such word in another language, the word and its equivalent being printed in different colors, or different colored cards may be used, each color representing different parts of speech, the design being to facilitate the acquisition of a large and correct vocabulary in one's own or another language.

FORMING SHIRT BOSOMS. — Maurice Price, New York City. This invention covers a machine adapted to turn and press the edges of shirt bosoms in forming the seams, and provides means whereby the marginal edges, having a curved, pointed, or irregular lower end or sides, may be expeditiously, conveniently, and evenly laid and fixed ready for sewing.

PEN HOLDER. — Ferdinand Knade, Breslau, Prussia, Germany. This invention provides, at the end of the holder which carries the pen, a longitudinally movable spring-pressed sleeve, to prevent soiling the user's fingers by ink taken up by the pen when dipped into the ink receptacle.

NEW BOOKS AND PUBLICATIONS.

AMERICAN RAILROAD BRIDGES. By Theodore Cooper. Engineering News Publishing Company, New York. Pp. 60. Price $2.

Theodore Cooper is well known as one of the engineers of the Washington Bridge of this city, which has already been several times illustrated in our columns. The treatise which we are considering was published originally in the Transactions of the American Society of Civil Engineers, and received a medal for its merit. It is a work which all civil engineers should study. It begins with some of the oldest bridges in the country, of which many very interesting illustrations are given, and after a rapid review of them, comes to statements in regard to the most recent practice. A series of illustrations are given of the various forms of trusses, and exhaustive tabular statements of the strength of bridge components as proved by recent tests of full sized members are included in the work. It should be understood that the plates, of which there are nearly thirty are not included in the paging of the book, so that it forms quite an extensive treatise.

THE DEVELOPMENT OF THE PHILOSOPHY OF THE STEAM ENGINE. By Robert H. Thurston. New York: John Wiley & Sons. 1889. Pp. v, 48.

With some slight modifications this work represents a paper read in 1884, at the Montreal meeting of the British Association for Advancement of Science. The author has won much distinction in the field of mechanical engineering, especially in that part of it relating to the steam engine. The title sufficiently indicates what the little work is devoted to, and the history given in its pages really includes a statement of the advanced practice in engineering.

Business and Personal.

The charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(1978) C. H. H. writes: I have a fountain with a glass globe ball to which a brass jet is attached. The brass which is attached to the glass globe becomes detached from the globe. Can you inform me of any kind of cement which will not be affected by the water which passes through the jet and which will fasten the glass globe and the metal jet together. If so, please inform me. A. Sealing wax melted up with about 1-10 its weight of beeswax is pretty good. The following is better: resin, 5 oz.; beeswax, 1 oz.; red ocher in powder, 1 oz. Melt together and have the surfaces hot before application. See query 2018.

(1979) R. W. T. asks: What to put into benzine, in order to deodorize it, without otherwise changing its nature? A. Agitate with oil of vitriol and chromic acid or bichromate of potash. After it has settled, decant and distill.

(1980) A. F. G. asks: How to make cheap and at reasonable cost about one gallon of Eau oxygenee, or peroxide of hydrogen, such as used for bleaching hair, etc. A. Mix 64 oz. binoxide of barium with same weight of water. Mix 37 oz. oil of vitriol with 64 oz. of water. Let it cool perfectly. Then gradually pour, with constant stirring, the acid into the other mixture. When all is added, test with litmus paper. If still acid, add a little more binoxide of barium in powder. Finally decant and filter if necessary. Keep in bottles with glass stoppers or with tight corks. It is well to keep the solutions cool by ice during the mixing operations.

(1981) M. G. asks the best means of pasting paper labels on gilt tin cans. A. See Query 1947. We recommend freshly made solution of gum tragacanth.

(1982) J. O. M. writes: I want to make a liquid glue of the best quality, if possible, without using acid. A. The following is recommended by some. White glue, 16 oz.; white lead dry and in finest powder, 4 oz.; rain water, 2 pints. Dissolve in a clean glue pot, constantly stirring. Then stir in 4 oz. alcohol, and heat for a few minutes longer. Bottle while hot. As a rule, liquid glue formulæ specify some kind of acid.

(1983) R. W. W. is referred to our SUPPLEMENT, Nos. 157, 158, and 159, for batteries of many kinds.

(1984) R. J. R. asks for (1) a receipt for making a preparation for coloring light leather black, so it will not rub off. A. Simple treatment with solution of iron sulphate or copperas will dye leather black. Acetate of iron may be used instead of above with advantage. The leather may first be mordanted with solution of logwood extract. 2. Can a person learn ventriloquism or does it come naturally? A. Ventriloquism can be learned to some extent by any one, but it requires good vocal organs and natural aptitude. We refer you to our SUPPLEMENT, No. 555, for a paper on the subject.

(1985) O. B. writes: 1. I want something which is cheap, flexible like cloth, inelastic, and transparent. Will you please inform me what fulfills these conditions the nearest? A. Tracing cloth, gelatine, and celluloid films are the nearest to your requirements. 2. I should like biographies of the more eminent scientists of the last few centuries. In what form can I get them? A. Consult the SCIENTIFIC AMERICAN SUPPLEMENT, in which we have published many illustrated biographies.

(1986) D. B. H. asks for the formula used in making artificial ice. A. Many ways of making artificial ice have been applied. The following are freezing mixtures, and the cooling they produce in degrees Fahr.

	Parts by weight.	
1. Sulphate of soda	8	from 50° to 0°
Hydrochloric acid	5	
2. Sulphate of soda	3	from 50° to -5°
Dilute nitric acid	2	
3. Sulphate of soda	6	from 50° to -14°
Nitrate of ammonia	5	
Dilute nitric acid	4	

Even nitrate of ammonia and water produce a considerable reduction in temperature. Sulphocyanide of ammonium produces still more, but is objectionable from danger of poisoning. For many mechanical processes, see our SUPPLEMENT, Nos. 32, 35, 73, 171, and many others.

(1987) J. B. asks: 1. How should the terminals of an induction coil be connected so as to get a variety of currents? As, for instance, the primary current alone, the secondary current alone, and the primary and secondary currents combined? A. For induction coil construction we refer you to our SUPPLEMENT, Nos. 160 and 569. To get the primary current you merely need to connect your electrodes to the terminals of the battery. 2. How is a mercury break or interrupter constructed? A. It is a steel or iron cup about ¼ in. diameter. One wire connects with it. It is filled with mercury, and the other terminal is arranged with a spring so as to dip into it when drawn downward, the whole operating like the ordinary make and break apparatus.

(1988) L. S. W. asks (1) how to tell lumber that is dry from lumber that is partly dry, white oak and white ash. A. There is no way of distinguishing dry from partly dry lumber, further than by the seasoning checks, which method is of no value if the lumber is exposed to rain. Use judgment. 2. How to deodorize alcohol on a small scale, from 1 to 5 gallons. A. A simple method consists in adding ¾ to 1¾ ounces of nitrate of silver to each 2,000 gallons of crude alcohol, and then to rectify. The nitrate of silver may be dissolved in water first. The following process is also given: 1 pound of animal charcoal is covered with water and mixed with ⅛ ounce of oil of vitriol, with constant stirring. After standing it is thoroughly washed. Mix the spirit with ¾ ounce ammonia to the gallon and pour over the bone black. After standing decant, filtering and distilling if necessary. Magnesia equal to one-tenth the weight of animal charcoal may be added to it.

(1989) F. H. G. says: An eminent New York dentist makes use of the term "a blind vacuum," in speaking of the phenomenon by which artificial teeth are retained in the mouth. Another writer on the same subject speaks of a "vacuum by contact." As a student of dentistry I wish to ascertain the scientific explanations of these expressions, but have been unable to find anything bearing on the subject. A. The word vacuum is in common use to indicate any negative pressure from 0 to 14·7 pounds per square inch. The words "blind vacuum" may be very proper in view of the fact that you do not see it, while the words "vacuum by contact" are equally applicable as implying the conditions for producing a partial vacuum by the adhesion of surfaces by wet contact, as so well illustrated by the sucker leather used by boys for lifting cobble stones. We used to call it suction. There is no vacuum under the leather, nor in the mouth between the surfaces, until an effort is made to lift the leather or remove the plate. The adhesion of the wet surfaces in the leather sucker allows the central portion to separate under sufficient negative pressure to lift the stone; while the same operation does not take place with the dental plate, the same effect is produced to make the adhesion perfect by the power of the tongue to make a partial vacuum along the edge of the plate, which is kept, without constant effort, by the adhesion of wet surfaces.

(1990) F. L. S. writes: I have a bear skin killed over a year ago, which was not touched until it became somewhat hard. The head, which I wish to mount, is as hard as a board, as also is the greater portion of the skin. How can I soften it so that I can mount the head and use the skin as a rug? A. It is very likely that portions of the skin became spoiled before it hardened, so that in soaking to thoroughly soften it up, which is the first thing to be done, it will be found that the hair will come off and portions of the skin will be putrid. If this is not so, and the hair is firm on the skin, after thorough softening rub well into it on the flesh side a mixture of about equal parts of salt and powdered alum, leaving enough on the surface to well cover it, and roll it up in a close package, leaving it thus for a week. Then shake out well, and repeat the operation with a mixture of two-thirds alum to one-third salt, and leave for about a week. A third application might be necessary for a heavy skin, but this would ordinarily be sufficient, and, after a thorough shaking out and beating, the skin should be very thoroughly worked on the flesh side with a blunt-faced hand tool, to soften it. To properly mount the head the skin should be removed from the skull, the skin and bone structure thoroughly cleaned, and all the parts as well as the skin treated with an arsenical powder composed as follows: Arsenic and burnt alum one pound each, ground oak bark two pounds, camphor ½ pound. Then replace the skin on the bone structure, supplying a frame for any natural portions omitted as well as for its base.

(1991) M. S. asks what to use on musk rat skins to make the hair remain on and make the flesh side soft, so that it can be used for caps and gloves. A. Use salt and alum and hand working as described above, only the time required will be considerably less.

(1992) I. C. G. asks for the formula for making universal German pomade for polishing metal. A. The following is given as the formula for putz pomade:

Oxalic acid	1 part.
Oxide of iron	25 "
Rotten stone	20 "
Palm oil	60 "
Vaseline	4 "

The oxide of iron may be Venetian red. Both it and the rotten stone must be absolutely free from grit. Oxalic acid is poisonous.

(1993) L. L. B. asks: 1. How many revolutions does the armature of the simple electric motor make in one minute? A. From 2,500 to 3,000. 2. Does the simple electric motor make as many revolutions when the plates are plunged an inch as when they are plunged the full length? A. When the motor is connected as a shunt machine, it regulates itself very well; but when it is connected as a series machine, its speed increases with the current. 3. I have made the armature of this motor of strips of zinc same size and thickness instead of No. 18 soft iron wire. Will it make any difference in the power of the motor or in any other way? A. Zinc will not answer; you must use iron in some form. Wire is preferable. 4. Is the power taken direct from the pulley of the hub of this motor? A. Yes. 5. How many volts of electricity is equal to one horse power? A. Voltage is only one element in the calculation of electrical horse power $\frac{E \times C}{746}$ is the formula for electrical horse power, *i. e.*, the electromotive force in volts multiplied by the current in amperes divided by 746, the number of watts equivalent to one horse power. 6. What is meant by the amperes? A. The ampere is the unit of the current. 7. What is meant by electroplating? A. The deposition of metals by an electric current. 8. What is meant by storage battery, and how is it made and for what is it used? A. A battery which may be so changed chemically by the passage of an electric current through it as to render it capable of giving out a current. 9. Is there any way of removing rust from from nickel? If so, please give me receipt. A. Try dilute sulphuric acid. 10. Have you ever published a full description how to make a small dynamo for electric lighting? A. Consult SUPPLEMENT, No. 600. 11. What is the best book for a boy 17 or 18 years old to learn all about the science of electricity? Also state price. A. "Experimental Science," price by mail, post paid, $4. 12. What is the best paint for a bicycle, also is there anything that will keep it from rusting? A. Asphaltum varnish is sold by bicycle dealers. Nothing can take the place of japanning, termed "enameling" by the trade, for this purpose.

(1994) D. M. S. asks: What can I use to give the black, velvety appearance to buckskin shoes which have lost their black appearance from age? A. First wet the surface well with strong alum water, and when nearly dry treat with a decoction of logwood boiled and filtered, to which is added a little acetate of iron. The skin will not be as soft as it originally was.

(1995) F. D. asks how to make rubber stamps. A. The India rubber, unvulcanized but mixed with the proper amount of sulphur, is placed in the mould and heated and pressed into all the cavities. It is held thus pressed and is heated in a vulcanizer. The details of India rubber working are given in our SUPPLEMENT, Nos. 249, 251, 252. The intaglio from which the letters are cast may be in plaster of Paris, type having been used as models.

(1996) W. M. writes: Will you kindly give receipt for making concentrated lye (solid)? A. Concentrated lye is simply solid caustic soda. It may be melted and poured into iron cans and hermetically sealed. Carbonate of soda may be made caustic by addition of lime, and then after decantation may be evaporated to dryness.

(1997) E. M. writes: 1. I have made a couple of cells of electric light carbon battery described by you in your paper of December 17, 1887, and they work admirably. I use them on open circuit, and should be glad if you would inform me how to keep them in good order. I have added a little sal-ammoniac occasionally, and replaced the water lost by evaporation. Will it be necessary to renew carbons when zincs are used up, or can they be used indefinitely? A. You are giving it all the care required. From time to time the water should be poured off and replaced by fresh water with sal-ammoniac. It is also well to coat edges of the jar with paraffin. For open circuit work one zinc is enough; the great point is to have plenty of carbons. 2. I have a small quantity of waste gold mixed chiefly with lime; have tried to recover it by melting it with almost every kind of flux, but without success. Can you inform me of a simple way to recover all the gold? A. Moisten the lime with water, then dissolve in muriatic acid. The gold will be left undissolved, and can be removed by filtration or decantation.

(1998) E. H. I. asks: With what force will a two hundred pound weight strike if it fall three feet, and give us a formula for any weight and any height? A. Divide the distance fallen by the distance passed through after impact, and multiply the weight by this factor for average force of impact. If your weight after impact descends ¼ inch, the average force will be 21,600 lb.

(1999) San Francisco asks: If a perforated piece of circular iron be subjected to heat, will the holes become larger or smaller? A. Heating tends to increase the size of such an aperture.

(2000) R. H. asks: 1. Can you explain how rheumatism may be cured by wearing brass chains around the wrists or ankles? A. It cannot be so cured. 2. Will you please give me the composition of methyl violet? A. One part by weight of rosaniline, 2 parts iodide of ethyl, and about 2 parts of strong methylated spirit are heated together. Part of the hydrogen of the rosaniline is replaced by methyl. There are a number of methyl violets, whose composition varies. The above is a typical method of preparation.

(2001) C. F. J. writes: Trautwine's Engineer's Pocket Book says a man can exert from one-sixth to one-tenth of a horse power. The small motors made to run sewing machines are rated at one-eighth horse power. Would one of these motors with primary battery propel an ordinary rowboat three miles an hour? A. Yes, if you have battery enough. The arrangement would be very expensive and troublesome.

(2002) Quiz asks for a formula for computing internal resistance of any battery in which the liquid is water thoroughly saturated with bichromate of soda and acidified with sulphuric acid. Plates 1 zinc between 2 carbons, all of equal size. A. Take area of both sides of zinc plate in square inches and divide by 3; multiply this by the distance from zinc to carbon surface. This, however, will give too low a resistance, as the resistance in practice rapidly runs up.

(2003) H. K. asks: 1. How can the "shine" on coats and pants be removed without washing same? A. It is said that skillful tailors remove the shine in the process of pressing by creating steam rapidly within the fabric by means of the iron, and immediately removing the latter. 2. I have an electric bell, the electro-magnet being wound with No. 32 insulated wire. What kind of battery would be the cheapest, and how many cells are necessary to ring it? A. This is rather fine wire for a bell. You will probably require 2 or 3 cells of Leclanche battery to operate it.

(2004) E. A. W. writes: Please give description in SCIENTIFIC AMERICAN how to construct a home-made magnetic call bell or reference to one that may have already been described and overlooked. A. For description with working drawings of above, we refer you to our SUPPLEMENT, No. 162.

(2005) F. M. S. asks: Can you give a formula for a good coating paint that will stand the heat in furnace stacks? A. A paint made with ground graphite and coal tar makes a durable material for painting smoke stacks and boiler fronts. If too thick, thin the mixture with turpentine. Make the ground graphite from a quarter to one-half the bulk of the coal tar.

(2006) W. A. D. asks for information as to how to make whitewash that will not rub off. A. To ½ bushel best lime, slaked with boiling water, add 8 quarts salt previously dissolved in hot water, ½ pound whiting, 2½ pounds ground rice boiled to a thin paste, 1 pound clean white glue dissolved and boiled. Thin with hot water and boil the whole. Apply warm.

(2007) R. R. S. writes: The recent disaster in Arizona is, it seems to us, another example of the lack of engineering skill, and we certainly hope you will give your readers the benefit of whatever information there may be to be derived from this catastrophe. Having personally been in charge of a large reservoir (some twelve hundred acres) at the head of Farmington river, in the State of Massachusetts, for the past fifteen years, we have realized the dangers, and any instruction which can be obtained we are of course very thankful for. A. A very large percentage of the reservoir dams throughout the United States are not made in view of the contingencies of extraordinary flood or the future change in the condition of the surrounding country for holding back flood water. Every dam that has burst in recent times has had the element of cheapness or ignorance of responsibility as its most prominent feature. The neglect of the proper width of a flooded spill now menaces hundreds of reservoir dams. Long foot slopes, broad and high crests, with spills of suitable length and strength for tornado cloud bursts; and arched facing of large stone laid in cement, together with honest packing in the water wall, are necessities of safety that should be applied to hundreds of dams now in jeopardy. Riprap and soil dams should not be tolerated unless thoroughly supported. A few hundred dollars spent in strengthening a cheap dam may save valuable lives and millions of property.

(2008) F. C. asks: 1. Why is not the stomach itself digested? A. The act of digestion is not completed in the stomach, and the vital force, with its preservative and renewing powers, prevents any deterioration of the tissue. In general terms the stomach has the power of accomplishing some of the early stages of digestion of dead matter. 2. What is the use of the spleen? A. It is uncertain. According to the most probable view, it contributes some constituent to the blood; possibly the red corpuscles. Animals can live without it; its extirpation has been performed.

(2009) G. G. writes: Can you tell me the process for bleaching the hair? A. The hair is sponged with "bleach," which is a solution of binoxide of hydrogen. See query 1980. A little ammonia may be added to bring out a reddish tint.

(2010) S. M. writes: How do you find the area of a segment of a hyperbola? A. You will find the rule in Haswell's "Mechanic's and Engineer's Pocket Book," $4 by mail, on page 384. The formula is too long for us to quote here. It is deduced by calculus, under quadratures of curves.

(2011) B. F. C. asks: If a thermometer be held in a running stream, will it indicate the same temperature that it would in a pailful of the same water? A. It will. The motion of the water does not perceptibly rise in temperature on impact with the thermometer.

(2012) D. asks for a recipe for a black dressing for saddles and bridles. A. Many formulæ are given. Try the following: Mutton suet, 2 oz.; beeswax, 6 oz.; rock sugar powdered, 6 oz.; soft soap, 2 oz.; lampblack, 2½ oz.; indigo powdered, ½ oz. When mixed add ½ pint turpentine.

(2013) Art asks: How to bleach orange gum shellac white. A. Rub up with and dissolve in 2 lb. water 2 lb. chloride of lime. Add to above 4 oz. caustic potash in 1 lb. of water. Digest 2 lb. of the shellac in 1 gallon of alcohol for a few days. Add the above fluid then with constant stirring, and after half an hour add excess of hydrochloric acid. Pour off the fluid after the shellac has separated, wash the shellac with boiling water until the latter comes off clear, place the shellac on a moist board, and dry.

(2014) W. A. M. writes: I want to get some brilliant writing fluids other than black or red for abstract of title work, which, as you well know, demands the very best staying qualities. Will you kindly furnish some formulæ? A. Blue ink: Dissolve 2 parts Prussian blue, previously washed with hydrochloric acid and followed by water, in 32 parts water with addition of as little oxalic acid as will effect the solution, say 1 part. A little gum arabic may be added. Or dissolve 1 part sulphate of indigo in 32 parts water. Violet ink: Dissolve 38 parts logwood extract in 550 parts boiling water. Then, using a small portion of this solution, dissolve in four separate vessels: *a*, 20 parts alum; *b*, 1¼ cream of tartar; *c*, 15 of gum arabic; *d*, ⅛ of crystallized verdigris. Add these in the order named to the original solution, and mix with a very little creosote or oil of cloves as a preservative.

(2015) L. R. D. writes: In your issue of February 1, you state that "in all wheeled vehicles the upper part of the wheel moves at a greater velocity than the lower, or part touching the ground." Would you kindly explain why that is? A. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 706, for explanation of the wagon wheel question and kindred subjects.

(2016) R. W. H. asks: Is it possible to run one electric lamp by the aid of batteries? How many batteries would it take to run a lamp of 10 or 15 candle power? What is the probable cost of an Edison lamp of that power? A. This is possible, but it does not pay. It would take 25 or 30 cells of bichromate battery. The lamp is worth 75 cents.

(2017) H. F. W. writes: I have seen a certain kind of tissue paper which serves as a kind of barometer. The changes of the weather cause the paper to change color. Will you please give me the receipt? A. The paper is saturated with a solution of chloride of cobalt.

(2018) F. G. R. asks: 1. What kind of cement is good for affixing brass to glass? A. Copal varnish, 15 parts; linseed oil varnish, 5 parts; oil of turpentine, 5 parts; glue, 5 parts. Mix and dissolve on a water bath. When solution is complete, add slaked lime, 10 parts. Or use ordinary sealing wax. 2. How can I procure a phonograph? A. You cannot buy a satisfactory phonograph. They are only rented. The original ones are only of scientific interest, but have no practical value. Address the North American Phonograph Company, of this city, for terms of rental. They will show you the capabilities of the phonograph if you call upon them. See query 1978.

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Fan, portable, W. H. Curtice ... 422,737
Farm gate, F. W. Beardslee ... 422,491
Faucet, measuring, F. Keiser ... 422,530
Feed block for animals, G. F. Brott ... 422,370
Feed regulator, C. J. Pilliod ... 422,623
Fence, G. W. Alexander ... 422,684
Fence, A. Deal ... 422,574
Fence, W. S. Kline ... 422,422
Fence, J. Ligon ... 422,813
Fence, V. E. Wilder ... 422,675
Fence making machine, wire and slat, J. Edmondson ... 422,749
Fence stretcher, wire, F. H. Bissell ... 422,494
Fence, wire, M. M. Shellaberger ... 422,482
Ferrule for canes, umbrellas, etc., S. W. Evans, Jr ... 422,753
Fibrous material and making the same, article of chemically treated, R. P. Frist ... 422,760
Filtering and percolating stand, adjustable, A. P. Yarnall ... 422,484
Firearm, H. Comstock ... 422,731
Firearm, breech-loading magazine, C. E. Sneider ... 422,846
Fire escape, E. B. Allen ... 422,685
Fishing reel, E. Holzmann ... 422,786
Fishing rod, jointed, G. I. Varney ... 422,470
Flaxseed separating machine, L. J. B. Easton ... 422,748
Flooring, J. D. Finley ... 422,584
Fluid motor, B. B. Bower ... 422,495
Folding table, T. Schwencke ... 422,639
Frame. See Capsule receiving frame. Drill frame. Net frame.
Fruit drier, W. A. Beck ... 422,897
Fruit gatherer, H. Caldwell ... 422,373
Fuel burning apparatus, liquid, J. B. Hough ... 422,884
Funnel, measuring, W. A. Benton ... 422,700
Fur, etc., from the skin, separating, C. Puech ... 422,627
Furnace for burning natural gas, F. T. Adams ... 422,562
Furnace roof, nail or other, W. J. S. Sheibley ... 422,893
Gauge. See Cock gauge.
Galvanic battery, J. H. Linville ... 422,534
Galvanometer, J. Waring ... 422,672
Game apparatus, H. A. Doty ... 422,575
Game, card, E. E. Koehler ... 422,807
Game promoting the study of language, card, E. E. Young ... 422,682
Garment supporter, J. G. Capers ... 422,719
Gas, apparatus for the manufacture of, J. D. Averell ... 422,692
Gas burner, regenerative, Gordon & Swift ... 422,587, 422,589
Gas burners, device for lighting, F. Thiele ... 422,659
Gas regulator, G. W. Wright ... 422,483
Gate. See End gate. Farm gate. Tender gate.
Gate, W. A. Pierce ... 422,831
Generator. See Current pulsating generator. Electric generator. Steam generator.
Guard. See Railway track foot guard.
Gun, breech-loading, C. Rostel ... 422,838
Gun carriage, S. H. Emmens ... 422,515
Grading and ditching machine, W. C. Williams ... 422,870
Grain binder, W. M. Holmes ... 422,414
Grain binder, H. E. Pridmore ... 422,444
Grain binders, knot tying mechanism for, M. A. Keller ... 422,798
Grain meter, rotating, G. U. Pollard ... 422,832
Grain separator, J. F. Hatfield ... 422,776
Grate, F. M. Goodall ... 422,763
Grate, parlor, C. J. Wadsworth ... 422,471, 422,472
Grate, ventilating, P. Miller ... 422,887
Gravel washer, C. S. Clark ... 422,378
Grinder, tool, L. B. Benton ... 422,874
Grindstone tool holder, A. H. Dick ... 422,743
Grommet, A. J. Robinson ... 422,633
Halter, W. E. Pruyne ... 422,626
Hame trace attachment, C. E. Carr ... 422,377
Handle. See Car brake handle. Saw handle.
Hanger. See Clock hanger. Tobacco hanger.
Harrow, R. W. Hardie ... 422,406
Harvester, S. D. Locke ... 422,601
Harvester, grain binding, L. Miller (r) ... 11,064, 11,065
Hay knife, W. H. Carter ... 422,724
Hay sling, J. Unterbrink ... 422,668
Heating apparatus, automatic gas regulator for, I. M. Seamans ... 422,841
Hinge for rules and protractors, lock, E. Cameron 422,374
Hoe and cultivator, horse, J. N. Parker ... 422,620
Hoe, garden, Koch & Biel ... 422,783
Holder. See Copy holder. Grindstone tool holder. Pew holder. Plate holder. Sewing machine attachment holder.
Hoof expander, E. Arnold ... 422,488
Hook. See Checkrein hook. Snap hook. Whiffletree hook.
Horse breaking apparatus, J. R. Brought ... 422,497
Horseshoes, machine for forming blank bars for, J. D. Billings ... 422,564
Ice, etc., machine for making, C. Bradford ... 422,565
Ice planer cutter, J. N. Briggs ... 422,566
Indicator. See Cash indicator. Time indicator.
Inductorium, A. H. Hoyt ... 422,885
Ingot and wire made therefrom, compound, L. L. Burdon ... 422,713
Inhaler, A. S. Johnston ... 422,420
Inhaling instrument, M. W. Hobbs ... 422,411
Ink, printing, McCloskey & Farwell ... 422,430
Insulating layer for electric coils, compound, E. Thomson ... 422,550
Insulator, G. E. Stanley ... 422,651
Iron. See Sad iron.
Jack. See Lifting jack.
Jack wrench for oiling vehicle wheels, F. M. Henshaw ... 422,779
Joint. See Mortise joint.
Journal boxes, lining, R. Beddall ... 422,873
Journal boxes, machine for constructing, W. H. Haskins ... 422,590
King bolt supporter, A. R. Muterspaugh ... 422,821
Kitchen cabinet, C. C. Post ... 422,833
Knife. See Hay knife.
Knife, R. S. Thain ... 422,547
Knit fabric, drawers of, R. W. Scott ... 422,641
Knit fabric, shirt of, R. W. Scott ... 422,640
Knitting machine, circular, Huse & Carr ... 422,593
Knitting machine needle cylinder, J. C. Egly ... 422,751
Knitting machine, warp, C. F. Smith ... 422,646
Knitting stockings, F. Wilcomb ... 422,869
Knob attachment, door, S. H. Berrey ... 422,493
Lamp, J. F. Place ... 422,537
Lamp, A. C. West ... 422,864
Lamp, arc, G. C. Pyle ... 422,446
Lamp, incandescent gas, J. N. Pew ... 422,536
Lamp, overhead oil, Ross & Atkins ... 422,836, 422,837
Lamp, regenerative gas, W. C. Bucklin ... 422,567
Lamp, regenerative gas, Gordon & Swift ... 422,588
Lamp, safety, R. Kopetchi ... 422,808
Lamp socket, incandescent, F. C. Rockwell ... 422,634
Lamp suspension device, incandescent, Hayden & Dikeman ... 422,591
Lasting machine, Copeland & Crisp ... 422,734
Lasting machine, M. L. Hansen ... 422,774
Lathe, O. Kromer ... 422,809
Lathe treadle foot, F. Thomas ... 422,465
Letter box, R. M. Haan ... 422,401
Lifter. See Wagon body lifter.
Lifting jack, G. F. Quinn ... 422,539
Light. See Locomotive head light.
Lighting fixture, P. C. J. Lemaire ... 422,811
Liquid distributer, F. W. Kendall ... 422,799
Lister and drill, combined, W. A. Loughry ... 422,603
Lock. See Alarm lock. Car lock.
Lock, E. F. Davis ... 422,740
Locomotive attachment, R. L. Stevens ... 422,653
Locomotive headlight, H. C. Crowley ... 422,503
Loom shuttle, T. Wood ... 422,481
Low water alarm for steam boilers, E. E. Kildoyle ... 422,803
Lumber, apparatus for making compound, Joslin & Thompson ... 422,794, 422,795
Lumber way, Ford & Revelle ... 422,389
Magnet, electro, R. Eickemeyer ... 422,512
Magnetic separator, G. Conkling ... 422,732
Marking rails, etc., apparatus for, T. James ... 422,594
Masonry, head or collar for supporting tubes in, E. N. Gates ... 422,881
Mat. See Door mat.
Meat cutter, A. Shepard ... 422,644
Metal plates, machine for flanging and nozzling, Nugent & Stupakoff ... 422,615
Meter. See Grain meter.
Milk cooler, J. J. Willard ... 422,676
Mill. See Chili mill. Quartz mill.
Mill boot or pestle, N. B. Tilton ... 422,661
Milling machine, C. H. Trask ... 422,663
Mirror, adjustable, F. M. Chapman ... 422,501
Miter cutter, W. R. Fox ... 422,517
Mitering machine, W. Murphy ... 422,608
Mould. See Casting mould.
Mouldings, embossing and edge-shaping roller, B. C. J. Anderson ... 422,486
Mop wringer and washer, automatic, R. C. Andersen ... 422,487
Mortise joint, blind, J. A. Smith ... 422,843
Motor. See Clipping machine motor. Current motor. Electric motor. Fluid motor.
Mower attachment, lawn, I. Wagner ... 422,473
Net frame, landing, T. H. Chubb ... 422,502
Nut kernels, machine for granulating, T. Mills ... 422,818
Nut, screw, G. H. Alton ... 422,361
Oil to burners, apparatus for feeding, De St. Aubin & Comstock ... 422,848
Ointment for skin diseases, A. Bergmann ... 422,703
Oven, revolving reel bake, J. Rayney ... 422,629
Overalls, C. Erlanger ... 422,386
Overshoe, T. H. Benedict ... 422,492
Padlock, A. S. Fisher ... 422,759
Pan. See Evaporating pan.
Paneling doors or other woodwork, J. A. Smith ... 422,844
Paper box blank, W. Johnston ... 422,792
Paper match boxes, casing for, T. Harbeck ... 422,405
Paper roll, toilet, S. Wheeler ... 422,866
Paving block, P. Arnold ... 422,690
Pawl and ratchet mechanism, W. Bayley ... 422,696
Pen, fountain, O. E. Weidlich ... 422,474
Pen holder, F. Knade ... 422,805
Pencil sharpener, lead, A. Ames ... 422,485
Perambulator, E. A. Harris ... 422,407
Photographic camera, W. A. Brice ... 422,709
Photographic camera shutter, E. W. Perry, Jr ... 422,825
Photographic shutter, J. R. Trego ... 422,664
Photographic stand, H. Wild ... 422,559
Pianofortes, pedal action for, C. L. Weser ... 422,477
Picture card, W. Hagelberg ... 422,522
Picture, sectional, W. Hagelberg ... 422,521
Pipe stopper or closer, soil, F. Darmstadt ... 422,739
Piston, H. See ... 422,453
Piston, horizontal, H. See ... 422,454
Pitman, S. Arnold ... 422,489
Plaiting machine, accordion, E. E. Howell ... 422,787
Planter and fertilizer distributer, combined seed, J. T. Scarbrough ... 422,452
Planting machine, corn, A. H. Hull ... 422,416
Plants, device for distributing Paris green on, Hills & Jurgenson ... 422,782
Plastering device, J. Hudson ... 422,528
Plate holder and shifter, Kipper & Perry, Jr ... 422,804
Platform. See Car platform.
Plow, J. W. Fields ... 422,756
Plow, J. W. Jackson ... 422,418
Plow, J. A. Stewart ... 422,896
Plow, sulky, F. J. Merrow ... 422,605
Plush fabric, woven, G. Rath ... 422,447
Pneumatic dispatch apparatus, A. Bryson, Jr ... 422,498
Poke, animal, A. R. Moore ... 422,820
Pole, carriage, W. A. Galbraith ... 422,393 to 422,398
Pole, carriage, B. F. Wheeler ... 422,478
Polishing powder, E. P. Eells ... 422,750
Powder. See Baking powder. Polishing powder.
Powder press, Loflin & Shaw ... 422,602
Press. See Baling press. Power press. Printing press.
Printing machine, C. H. Heywood ... 422,883
Printing machine feeding apparatus, C. B. Cottrell ... 422,572
Printing press, two-revolution cylinder, J. W. Butterfield ... 422,715
Printing presses, knife box rubber for, W. H. Eager ... 422,576
Pulley, W. H. Dodge ... 422,507
Pulley, split, H. Burnham ... 422,568
Pulleys, manufacture of, J. T. Mitchell ... 422,606
Pulverizer, centrifugal, J. Behm ... 422,698
Pump, W. H. Culver ... 422,383
Pump, J. M. Normand ... 422,535
Pump, Taft & Day ... 422,461
Pumps, induction valve for compression, M. Dennedy ... 422,385
Punch, R. M. & T. E. Tull ... 422,666
Punch, check, F. M. Clark ... 422,728
Puzzle, J. H. Flanagan ... 422,388
Quartz mill, J. W. Fairfield ... 422,581
Quartz mill battery guide, Leyson & Dalling ... 422,812
Radiator boring and tapping machine, O. Bryant ... 422,877
Radiator, steam, G. H. Roath ... 422,541
Railway chair, M. H. Pierce ... 422,830
Railway, electric, S. H. Short ... 422,645
Railway motors, supporting frame for electric, E. D. Priest ... 422,445
Railway, pleasure, L. A. Thompson ... 422,466
Railway signal, automatic recording, J. B. Ivey ... 422,790
Railway switch, R. J. Davidson ... 422,573
Railway switch, D. J. McOsker ... 422,610
Railway time signal, Bechtel & Moebus ... 422,367
Railway track foot guard, J. M. Wilson ... 422,560
Range, E. Lofts ... 422,426
Reel. See Fishing reel.
Reflector for incandescent lamps, F. Holman ... 422,592
Refrigerator, Schneider & Miller ... 422,637
Register. See Autographic register. Cash register.
Regulator. See Dumbwaiter regulator. Feed regulator. Gas regulator. Windmill regulator.
Ring. See Twister ring.
Rivet, hollow, I. F. Peck ... 422,824
Rod. See Fishing rod.
Roofing machines, scraper bar for composite, J. A. McGraw *et al* ... 422,609
Rotary engine, W. I. Phifer ... 422,829
Rule, draughtsman's Benzinger & Grabau ... 422,701
Sad iron, self-heating, E. M. Roberts ... 422,448
Saddle, harness, Garrett, Jr., & Huggin ... 422,762
Sash balance, Ellis & Langbein ... 422,580
Sash fastener, J. E. Kreidler ... 422,597
Saw, W. F. Hurd ... 422,788
Saw handle, M. E. True ... 422,468
Saw setting and jointing device, S. Toles ... 422,467
Scales, automatic grain, H. Earle ... 422,747
Scraper, wheeled earth, W. E. Kilborn ... 422,531
Scraping and ditching machine, road, F. M. Pennock ... 422,621
Screwdriver, O. Z. Greene ... 422,520
Screwdriver, W. R. Johns ... 422,791
Seat. See Vehicle seat.
Secondary battery, S. C. C. Currie ... 422,504, 422,505
Separating machine, N. W. Holt ... 422,785
Separator. See Grain separator. Magnetic separator. Steam separator.
Sewing machine attachment holder, E. J. Toof ... 422,554
Sewing machine embroidering attachment, J. T. Whitmore ... 422,558
Sewing machine hem stitching attachment, E. J. Toof ... 422,553
Sewing machine thread tension mechanism, J. Angermann ... 422,691
Shaft coupling, E. P. H. Capron ... 422,720
Shaft support, W. H. Heald ... 422,408
Shears, A. H. Waliace ... 422,670
Sheet metal folding machine, W. Dixon ... 422,744
Shell for high explosives, A. W. Von Schmidt ... 422,636
Shingle, C. B. Cooper ... 422,571
Shipping can, J. T. Harland ... 422,525
Ship's rigging, J. Parker ... 422,619
Shirt bosoms, machine for turning and pressing the edges of, M. Price ... 422,625
Shutter fastener, F. Taylor ... 422,463
Shutter opening apparatus, J. E. Tryon ... 422,665
Shutters, slat for rolling, Bockel & Lochmann ... 422,707
Signal. See Railway signal. Railway time signal.
Siphons, attachment for, W. H. Carley ... 422,721
Sleighs, hand rail for, G. S. Caldwell ... 422,372
Snap hook, J. Kennedy ... 422,801
Snow scraping machine, O. S. Wheeler ... 422,674
Sodawater draught apparatus, A. D. Puffer ... 422,834
Soldering machine, J. G. Hodgson ... 422,412
Soldering machine can cap, Norton & Hodgson ... 422,434
Spark arrester, E. B. Gibbs ... 422,586
Spoke socket, F. E. Kauffmann ... 422,797
Spring. See Door spring. Vehicle spring.
Sprinkler. See Water sprinkler.
Stand. See Filtering and percolating stand. Photographic stand.
Steam engine, L. B. Phillips ... 422,622
Steam generator, C. H. Farwell ... 422,754
Steam generator, J. J. & T. F. Meldrum ... 422,816
Steam separator, J. L. Cook ... 422,733
Steel containing carbon, manganese, and aluminum, making, R. A. Hadfield ... 422,403
Stencil drum, J. Parish ... 422,889
Stocking, F. W. Berger ... 422,702
Stocking, F. Wilcomb ... 422,868
Stockings, manufacturing, E. E. Kilbourn ... 422,886
Stone lifting and carrying machine, J. W. Peterson ... 422,826
Stopper. See Pipe stopper.
Stove, oil, E. B. Finch ... 422,757, 422,758
Stove, straw burning cook, G. Laube (r) ... 11,063
Stoves, hot water attachment for, G. T. Brewer ... 422,496
Stoves, steam attachment for cook, W. S. Laney ... 422,598
Supporter. See Garment supporter. King bolt supporter.
Switch. See Railway switch.
Switch, Berrenberg & Umbehend ... 422,705
Syringe, G. Otto ... 422,437
Syringe, hypodermic, G. B. Ross ... 422,450
Syringe, hypodermical, G. Otto ... 422,436
Table. See Extension table. Folding table.
Tacker or nailer, J. C. Luchterhand ... 422,815
Tank. See Water closet tank.

Target pigeons, machine for moulding, C. Swan	422,655
Telegraph receiver, printing, H. Mahnken	422,604
Telephone call, automatic, H. L. Carpenter	422,722
Telephone repeater, T. A. Edison	422,578, 422,579
Telephone switch system, C. C. Gould	422,765
Telephones, apparatus for speaking, Edison & Gilliland	422,577
Temperature, automatic device for controlling, R. D. Kimball	422,595
Tender gate, R. J. Howard	422,527
Tether, B. E. Sergeant	422,642
Theatrical appliance, C. Barnard	422,362
Time alarm and annunciator, electric, N. H. Suren	422,654
Time indicator, G. L. Barrett	422,563
Tire sizing and upsetting machine, R. W. Taylor	422,658
Tobacco hanger, W. S. Wootton	422,679
Torch, flash, Heiskell & Drake	422,778
Trace support, F. F. Conner	422,382
Tramways, clip for rope, R. Rowland	422,892
Tray for delivering goods, F. G. Caldwell	422,717
Truck, barrel, G. P. Clark	422,729
Truss, G. A. Greene	422,768
Tube cutter, D. S. Chesebro	422,725
Twister ring, J. Belfield	422,699
Twisting machine, driving band, W. H. Naylor	422,611
Typewriting machine for the blind, E. J. Nolan	422,614
Typewriting machine type bar, Harkness & Quaife	422,775
Umbrella cover, C. H. Shaw	422,643
Umbrella tops to bows, device for attrching, A. A. Armstrong	422,688
Umbrellas or parasols, detachable cover for, A. J. Robinson	422,642
Umbrellas or parasols, machine for making springs for, G. Rich	422,835
Valve for gas service pipes, automatic, Finch & Hummel	422,583
Valve gear for engines, liberating, N. T. Greene	422,769
Valves, seat for pistons of triple, H. Fueller	422,392
Vehicle brake, automatic, C. Wening	422,475
Vehicle seat, J. McCrudden	422,431
Vehicle seat, M. Thorkelson	422,660
Vehicle spring, E. P. Holden	422,784
Vehicle, two-wheeled, C. S. Beebe	422,697
Velocipede, A. W. Thomas	422,548
Vines, compound for treating grape, E. Schmidt	422,544
Vise, O. Noack	422,613
Vote recording machine, J. W. Rhines	422,891
Wagon body lifter, S. Langford	422,424
Wagon, buckboard, G. E. Spare	422,649
Wagon, dumping, A. C. McEwen	422,822
Wagon, dumping, G. Worthington	422,561
Washboard, V. Landrieu	422,810
Washer. See Gravel washer.	
Watch balances, device for testing, W. D. Olney	422,616
Water closet tank, R. T. Hurst	422,417
Water ejector for vessels, automatic, N. N. Frost	422,391
Waterproof garment, P. H. Loehr	422,814
Water sprinkler, H. G. Stiebel	422,458
Water utilizing apparatus, rain, R. C. Sayer	422,451
Weighing and registering apparatus, grain, R. N. Robinson	422,542
Weighing and strength testing machine, coin-controlled, J. F. Bower	422,876
Welding, electric, C. L. Coffin	422,730
Wheel. See Car wheel.	
Wheel, J. J. Halstead	422,404
Whiffletree coupling, C. St. James	422,459
Whiffletree hook, F. P. Randall	422,628
Whip socket and rein holder, E. W. Sweigard	422,656
Windmill regulator, H. L. Ferris	422,582
Window cleaner, fountain, H. W. Munch	422,429
Window, folding bay, C. Fredrickson	422,585
Wire, making seamless plated hollow, H. T. Smith	422,647
Wool, machine for preparing and burring, F. G. & A. C. Sargent	422,655
Wrench. See Jack wrench.	
Wrench, O. P. Foote	422,516
Wrench, I. C. Gray	422,767
Wrench, F. E. Heinig	422,526
Wrench, J. Tomlinson, Sr	422,662
Wrench for oil well tools, W. Forgie	422,879
Wringer. See Mop wringer.	

DESIGNS.

Bathtub, F. J. Torrance	19,682
Button or similar article, sleeve, E. P. Beach	19,672
Carpet, W. A. Schmidt	19,683, 19,684
Clothes line link, J. J. Wallace	19,685
Dish, C. C. Overton	19,690
Drain or other pipe, E. W. Carter	19,677
Feeding manger, F. O. Worthley	19,686
Gas pipe band, W. H. Berger	19,673
Halter trimming, J. N. Bull	19,676
Hammer, C. Ottinger	19,689
Range, gas, W. W. Goodwin	19,678 to 19,681
Truck frame, electric car, J. Stephenson	19,688
Twine box, B. D. Milliken	19,691
Type, font of printing, H. Brehmer	19,674, 19,675
Vest, lady's, L. J. Haas	19,687

TRADE MARKS.

Bicycles, Union Cycle Manufacturing Company	17,608
Bookcases, revolving, J. Danner Manufacturing Company	17,613
Capsules, gelatine, Krehbiel Capsule Company	17,619
Cigars, H. Traiser	17,628
Farinaceous food, J. R. Neave & Co	17,621
Flour, prepared, Star Manufacturing Company	17,627
Hose supporters, G. Frost & Co	17,614
Medicine for curing diseases of the scalp, Clevenger Hair Balsam Co	17,612
Medicine to cure rheumatism, R. Senftner	17,625
Perfumery, C. B. Woodworth & Sons	17,616
Remedy for chills and fever and the like diseases, tonic, A. B. Richards Medicine Co	17,622
Rubber, footwear made wholly or partly of, Brook Haven Rubber Shoe Company	17,609, 17,610
Shirts, V. H. Rothschild & Co	17,623
Silk and silk and cotton fabrics, W. Skinner Manufacturing Company	17,626
Toilet powder, infant, G. Mennen	17,620
Toothpowder and cosmetics, G. W. Koester	17,618
Whisky, Schuetz, Renziehausen & Co	17,624
Wine, sherry, D. Hermanos	17,617
Yeast cakes, dry compressed, Cameron Manufacturing Co	17,611

A Printed copy of the specification and drawing of any patent in the foregoing list will be furnished from this office for 25 cents. In ordering please state the name and number of the patent desired, and remit to Munn & Co., 361 Broadway, New York.

Canadian Patents may now be obtained by the inventors for any of the inventions named in the foregoing list, provided they are simple, at a cost of $40 each. If complicated, the cost will be a little more. For full instructions address Munn & Co., 361 Broadway, New York. Other foreign patents may also be obtained.

FORTY-FIFTH ANNUAL REPORT

—OF THE—

NEW-YORK LIFE INSURANCE CO.

Office: Nos. 346 & 348 Broadway, New York.

JANUARY 1, 1890.

Amount of Net Assets, January 1, 1890 ..... $89,824,336.19

REVENUE ACCOUNT.

Premiums	$26,021,655.96		
Less deferred premiums, January 1, 1889	1,435,734.86—	$24,585,921.10	
Interest and rents, etc.	5,028,950.38		
Less interest accrued January 1, 1889	451,605.24—	4,577,345.14—	$29,163,266.24
			$118,987,602.43

DISBURSEMENT ACCOUNT.

Losses by death, and Endowments matured and discounted (including reversionary additions to same)	$6,252,095.50	
Dividends (including mortuary dividends), annuities, and purchased insurances	5,869,026.16	
Total Paid Policy Holders	$12,121,121.66	
Taxes and re-insurances	252,737.17	
Commissions (including advanced and commuted commissions), brokerages, agency expenses, physicians' fees, etc.	4,725,652.64	
Office and law expenses, rentals, salaries, advertising, printing, etc.	860,768.50—	$17,960,279.97
		$101,027,322.46

ASSETS.

Cash on deposit, on hand, and in transit	$5,917,837.72
United States Bonds and other bonds and stocks (market value, $60,488,441.91)	56,412,163.41
Real Estate	13,242,871.87
Bonds and Mortgages, first lien on real estate (buildings thereon insured for $14,400.00) and the policies assigned to the Company as additional collateral security)	18,106,512.50
Temporary Loans (market value of securities held as collateral, $4,671,563)	3,709,000.00
*Loans on existing policies (the Reserve on these policies, included in Liabilities, amounts to over $2,000,000)	367,394.39
*Quarterly and semi-annual premiums on existing policies, due subsequent to Jan. 1, 1890	1,635,645.37
*Premiums on existing policies in course of transmission and collection. (The Reserve on these policies, included in Liabilities, is estimated at $1,700,000.)	1,104,253.02
Agency balances	90,299.54
Accrued Interest on investments, January 1, 1890	441,344.64—$101,027,322.46
Market value of securities over cost value on Company's books	4,026,278.50

* A detailed schedule of these items will accompany the usual annual report filed with the Insurance Department of the State of New York.

TOTAL ASSETS, JANUARY 1, 1890, - - - - - - $105,053,600.96

Appropriated as follows:

Approved losses in course of payment		$440,517.97
Reported losses awaiting proof, etc.		375,398.86
Matured endowments, due and unpaid (claims not presented)		40,592.49
Annuities due and unpaid (claims not presented)		29,962.52
Reserved for re-insurance on existing policies (Actuaries' table 4 per cent. interest)		88,904,186.00
Reserved for contingent liabilities to Tontine Dividend Fund, January 1, 1889, over and above a 4 per cent. Reserve on existing policies of that class	$6,423,777.13	
Addition to the Fund during 1889	2,300,540.16	
	$8,724,317.29	
DEDUCT— Returned to Tontine policy-holders during the year on matured Tontines	1,019,264.18	
Balance of Tontine Fund January 1, 1890		7,705,053.11
Reserved for premiums paid in advance		40,046.73
		$97,535,777.68
Divisible Surplus (Company's New Standard)		7,517,823.28
		$105,053,600.96
Surplus by the New York State Standard (including the Tontine Fund)		15,600,000.00

From the undivided surplus, as above, the Board of Trustees have declared a Reversionary dividend to participating policies in proportion to their contribution to surplus, available on settlement of next annual premium.

Returns to Policy-holders.	Insurance in Force.	Assets.	New Policies issued.
1887 ..... $9,535,210	Jan. 1, 1888 ..... $358,935,536	Jan. 1, 1888 ..... $83,079,845	1887 28,522
1888 10,973,070	Jan. 1, 1889 419,886,505	Jan. 1, 1889 93,480,186	1888 33,334
1889 12,121,121	Jan. 1, 1890 495,601,970	Jan. 1, 1890 105,053,600	1889 39,499

Number of Policies issued during the year, 39,499. New Insurance, $151,119,088.

Total number of Policies in force January 1, 1890, 150,381. Amount at risk, $495,601,970.

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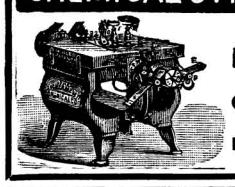

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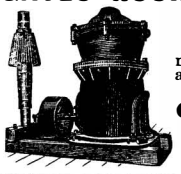

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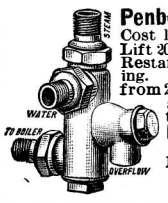

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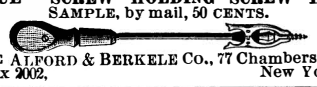
50c.  50c.
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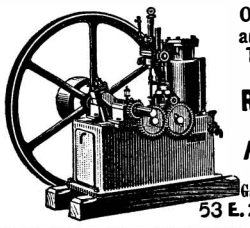

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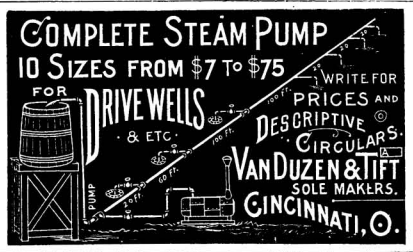

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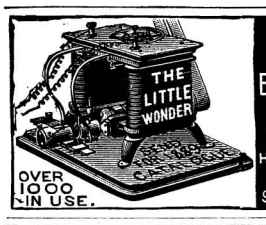

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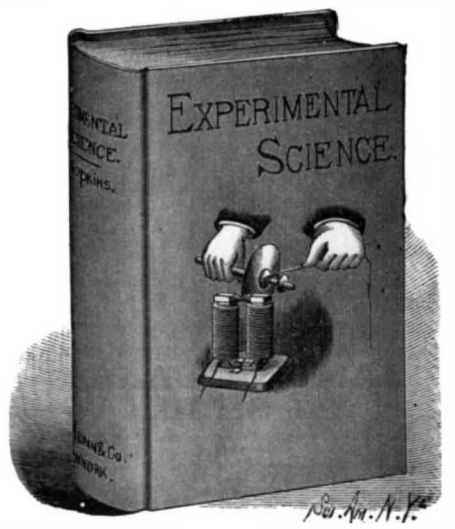

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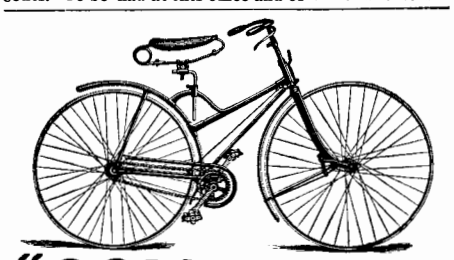

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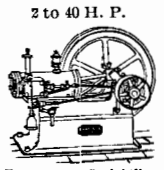

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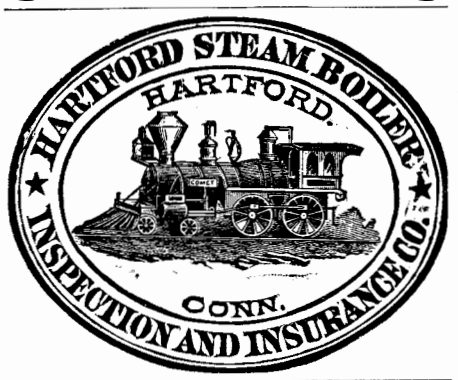

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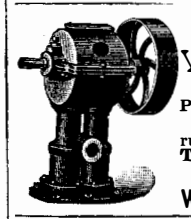

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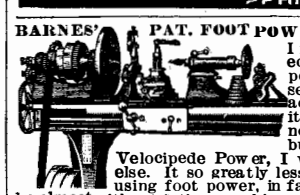

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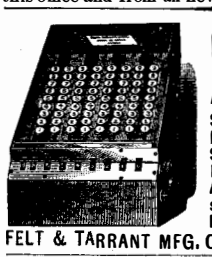

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